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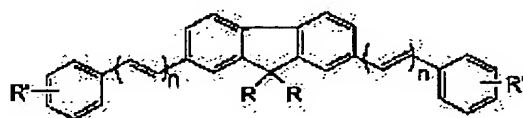
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(54) FLUORENE-BASED COMPOUND CONTAINING FUNCTIONAL GROUP, POLYMER THEREOF AND EL
 ELEMENT UTILIZING THE SAME

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an organic polymer semiconductor and a photoelectronic material, particularly a compound usable as an electroluminescent material.

SOLUTION: A fluorene-based compound represented by formula (1) (wherein R is hydrogen, a 1-22C aliphatic or alicyclic alkyl group or the like; R' is a functional group which exists at meta or para position of phenyl group; n is 0 or 1), a polymer thereof and an EL element utilizing these materials are provided.



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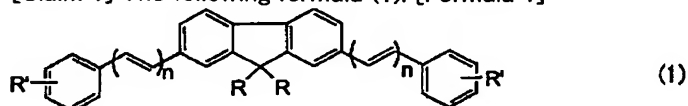
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CLAIMS

[Claim(s)]

[Claim 1] The following formula (1): [Formula 1]

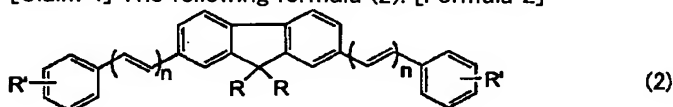


the inside of a formula, and R — the alkyl group of hydrogen, the aliphatic series of 1–22 carbon numbers, or an alicycle group, or an alkoxy group — It is the alkyl or the aryl derivative permuted by one or more sorts of the aryl of 6–18 carbon numbers, an aryloxy group or silicon, tin, and germanium. R' The functional group which exists in the meta or the para position of a phenyl group is shown. For example, the ether, Ester, amino, an amide, imide, the formyl, a ketone, a sulfone, A sulfide, nitroglycerine, cyano ** ethynyl, a halogen, carboxyl, A boric acid, vinyl, hydrazide, isocyanato, carbamoyl, a carbonate, the radical chosen from the group which consists of chloro methyl, the hydroxyl, an anhydride, SHIANATO, azomethine, a quinoline, OKISA diazole, and azo — it is — n — 0 or 1 — it is — the fluorene system compound shown.

[Claim 2] The fluorene system compound containing a functional group according to claim 1 whose maximum wavelength of photo luminescence is 300–600nm.

[Claim 3] The fluorene system compound containing a functional group according to claim 1 or 2 used as a luminescent material for the luminous layer of an EL element.

[Claim 4] The following formula (2): [Formula 2]



the inside of a formula, and R — the alkyl group of hydrogen, the aliphatic series of 1–22 carbon numbers, or an alicycle group, or an alkoxy group — It is the alkyl or the aryl derivative permuted by one or more sorts of the aryl of 6–18 carbon numbers, an aryloxy group or silicon, tin, and germanium. R' It is what showed the functional group which exists in the meta or the para position of a phenyl group. For example, the ether, ester, an amide, imide, a ketone, a sulfone, A sulfide, ethynyl, diethynyl one, vinyl, hydrazide, urea, It is the radical chosen from the group which consists of carbamoyl, a carbonate, azomethine, a quinoline, OKISA diazole, and azo. n 0 or 1 — it is — the fluorene system polymer which includes the product by the polymerization of a fluorene system compound different identically or mutually shown, and/or the product by the polymerization of the fluorene system compound shown by the above-mentioned formula (2), and other compounds.

[Claim 5] The acid addition salt generated when an acid is added to a fluorene system polymer according to claim 4.

[Claim 6] The acid addition salt according to claim 5 in which a fluorene system polymer according to claim 4 has azomethine, a quinoline, or an imide frame.

[Claim 7] The acid addition salt according to claim 5 said whose acid is an inorganic acid or an organic acid.

[Claim 8] The acid addition salt according to claim 7 said whose inorganic acid or organic acid is a hydrochloric acid or p-toluene sulfide.

[Claim 9] A fluorene system polymer or an acid addition salt given in any 1 term of claims 4–8 used as a luminescent material for the luminous layer of an EL element.

[Claim 10] The EL element characterized by using one or more sorts of the fluorene system compound of a publication, a polymer, and an acid addition salt for any 1 term of claims 1–9 as a luminescent material for the luminous layer of the EL element constituted by an anode plate / luminous layer / cathode, or an anode plate / electron hole transfer layer / luminous layer / cathode.

[Claim 11] The EL element according to claim 10 with which the giant molecule which includes a polyvinyl carbazole, Pori (1, 4-hexyloxy – 2, 5-phenylenevinylene), or Pori (3-hexyl thiophene) in the luminescent material of said luminous layer, and the fluorene system polymer are blended.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the EL element which used the acid addition salt of the new fluorene system compound which has an organic semiconductive polymer and a photoelectron ingredient, and the various functional groups that can be especially used as an EREKURO luminescence (it abbreviates to EL hereafter) ingredient, a fluorene system polymer, and a fluorene system polymer, and them.

[0002]

[Description of the Prior Art] An organic semiconductive polymer and a photoelectron ingredient (G. Hadziioannou and work edited by P.F.van Hutten Physics and Engineering [Semiconducting Polymers:Chemistry and] WILEY-VCH, 2000 reference, and a macromolecule EL ingredient (Angew.Chem.Int.Ed., 37, and p402 (1998) —) A typical thing well-known as Prog.Polym.Sci., 25, p1089 (2000) and Adv.Mater., 12, and p1737 (2000) reference Polyphenylene vinylene (it abbreviates to PPV hereafter), the poly thiophene (It abbreviates to PTh hereafter) And it is a polyphenylene system macromolecule (Synth.Met., 501 (1-3), p491 and (1992) Adv.Mater., 4, p36 (1992) reference). Research to these polymeric materials has so far been done as a subject. However, there was demerit in which the last matter was not dissolved in an organic solvent in these.

[0003] Moreover, raised workability by introducing the suitable substituent for said each macromolecule EL ingredient. PPV which emits light in light with various blue, green, and red, or a PTh derivative (Synth.Met. —) 62, p35 (1994), Adv.Mater., 4, p36 (1992) and Macromolecules, 28, and p7525 Reference (1995) was known, and these have a complicated production process and there was a problem also in stability.

[0004] moreover — although the macromolecule containing an acetylenic group is also announced (Makromol.Chem., 191, and p857 (1990) —) Macromolecules, 27, and p562 (1994), J.Chem.Soc., Chem.Comm., p1433 and (1995) Macromolecules, 29, and p5157 Reference (1996), As for these, the application study to a non-linear optical material, a photoconductivity, and photo luminescence (it abbreviates to PL hereafter) is mainly reported (Science, 279, and p835 reference (1998)).

[0005] in addition — although the polymer which has a diacetylene radical is also announced (Prog.Polym.Sci., 20, and p943 (1995) —) CHEMTECH, October, p32 and (1993) Macromolecules, 29, and p2885 Reference (1996), Since it is more sensitive to heat or light than the acetylene series macromolecule mentioned above and crosslinking reaction tends to occur, the application as a non-linear optical material, a thermally stable polymer, a polarization PL macromolecule, the electrical and electric equipment, and an optical-activity macromolecule is mainly possible for these. About what applied the macromolecule containing a new acetylenic group or a diacetylene radical as an EL ingredient, this invention persons have received the patent (a U.S. Pat. No. 5,876,864 specification and Japanese patent No. 3,046,814).

[0006] Moreover, although the fluorene system macromolecule which emits light in blue glow, and its manufacture approach are also reported (Jpn.J.Appl.Phys., 30, and pL1941 (1991)), this is the manufacture approach which cannot be applied to manufacture of the macromolecule which has various conjugated double bond. Moreover, this invention persons solve such a trouble and have already indicated the fluorene system shift copolymer for EL elements which has conjugated double bond (U.S. Pat. No. 5,807,974 specification).

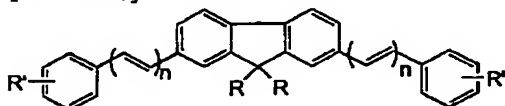
[0007]

[Problem(s) to be Solved by the Invention] However, the fluorene system polymer which has various functional groups as a macromolecule EL ingredient is not manufactured, and even if applied, it is not. A structure check is possible, it is easy to dissolve in an organic solvent, and the purpose of this invention is to offer the new fluorene system compound applicable as EL ingredient and other photoelectron ingredients which has various functional groups, the acid addition salt of the polymer, and the EL element which used them as a luminescent material.

[0008]

[Means for Solving the Problem] This invention is following formula (1): [0009].

[Formula 3]



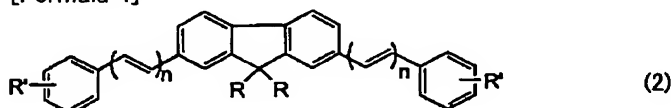
(1)

[0010] the inside of a formula, and R — the alkyl group of hydrogen, the aliphatic series of 1-22 carbon numbers, or

an alicycle group, or an alkoxy group — It is the alkyl or the aryl derivative permuted by one or more sorts of the aryl of 6–18 carbon numbers, an aryloxy group or silicon, tin, and germanium. R' The functional group which exists in the meta or the para position of a phenyl group is shown. For example, the ether, Ester, amino, an amide, imide, the formyl, a ketone, a sulfone, A sulfide, nitroglycerine, cyano ** ethynyl, a halogen, carboxyl, A boric acid, vinyl, hydrazide, isocyanato, carbamoyl, a carbonate, the radical chosen from the group which consists of chloro methyl, the hydroxyl, an anhydride, SHIANATO, azomethine, a quinoline, OKISA diazole, and azo — it is — n — 0 or 1 — it is — it is related with the fluorene system compound shown.

[0011] In addition, this invention is following formula (2): [0012].

[Formula 4]



[0013] the inside of a formula, and R — the alkyl group of hydrogen, the aliphatic series of 1–22 carbon numbers, or an alicycle group, or an alkoxy group — It is the alkyl or the aryl derivative permuted by one or more sorts of the aryl of 6–18 carbon numbers, an aryloxy group or silicon, tin, and germanium. R' It is what showed the functional group which exists in the meta or the para position of a phenyl group. For example, the ether, ester, an amide, imide, a ketone, a sulfone, A sulfide, ethynyl, diethynyl one, vinyl, hydrazide, urea, It is the radical chosen from the group which consists of carbamoyl, a carbonate, azomethine, a quinoline, OKISA diazole, and azo. n 0 or 1 — it is — it is related with the fluorene system polymer which includes the product by the polymerization of a fluorene system compound different identically or mutually shown, or the product by the polymerization of the fluorene system compound shown by the above-mentioned formula (2), and other compounds.

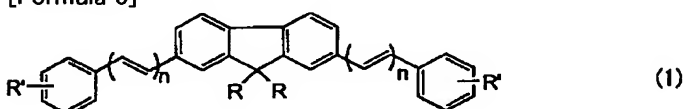
[0014] In addition, it is related with the EL element which uses one or more sorts chosen from the group which consists of an acid addition salt of the fluorene system compound of this invention, a fluorene system polymer, and a polymer as a luminescent material for the luminous layer of the EL element constituted by an anode plate / luminous layer / cathode, or an anode plate / electron hole transfer layer / luminous layer / cathode.

[0015]

[Embodiment of the Invention] The following formula (1) can show the fluorene system compound concerning this invention.

[0016]

[Formula 5]

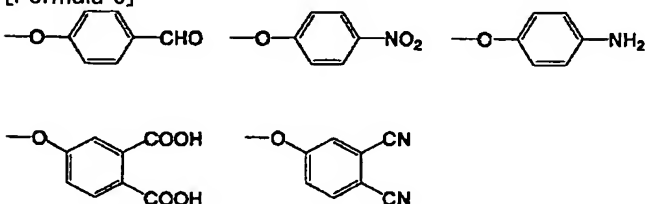


[0017] In the above-mentioned formula (1), R shows alkyl and aryl derivatives, such as the alkyl group of hydrogen, the aliphatic series of 1–22 carbon numbers, or an alicycle group or an alkoxy group, aryl of 6–18 carbon numbers, an aryloxy group or silicon, tin, and germanium. R' shows the functional group which exists in meta or a para position to a phenyl group. In addition, in the above-mentioned formula (1), n is 0 or 1.

[0018] Specifically as an example of R of the above-mentioned formula (1), hydrogen, methyl, ethyl, propyl, isopropyl, butyl, isobutyl, pentyl, hexyl, ethylhexyl one, heptyl, octyl, iso octyl, nonyl, DESHIRU, dodecyl, hexadecyl, octadecyl, DOKODESHIRU, cyclo propyl, cyclopentyl, cyclohexyl, methoxy, ethoxy ** butoxy, hexyloxy one, methoxy ethoxyethyl, methoxyethoxy ethoxyethyl, phenyl, phenoxy, tolyl, benzyl, naphthyl, or an anthryl radical is mentioned. As an example of R which is the alkyl and the aryl derivative which were permuted in silicon, tin, germanium, etc., trimethylsilyl, triphenyl silyl, tributyltin, triethyl germanium, etc. are mentioned, for example.

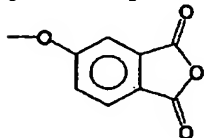
[0019] Moreover, in the above-mentioned formula (1), R' shows the functional group which exists in the meta or the para position of a phenyl group, it is easy to manufacture, and especially if excelled in a property, it will not be restricted. Although a functional group is formed and the ether, ester, amino, an amide, imide, the formyl, a ketone, a sulfone, a sulfide, nitroglycerine, cyano ** ethynyl, a halogen, carboxyl, a boric acid, vinyl, hydrazide, isocyanato, carbamoyl, a carbonate, chloro methyl, the hydroxyl, an anhydride, SHIANATO, azomethine, a quinoline, OKISA diazole, azo, others, etc. are included by the example, it is not limited to this. Alkyl carbonyl like alkoxy carbonyl; acetyl like alkynyl; carboxyl; ethoxycarbonyl like alkenyl; ethynyl like alkoxy; vinyl like cyano alkyl; methoxy like hydroxyalkyl; —CH₂CN like halo alkyl; —CH₂OH like alkyl; —CH₂Cl like hydroxy; —Br and halogen; CH₃ like —F as an example of the desirable functional group of R' including these; it is following radical: [0020].

[Formula 6]



The radical which comes out and is guided from the ether as shown; the following radical : [0021]

[Formula 7]



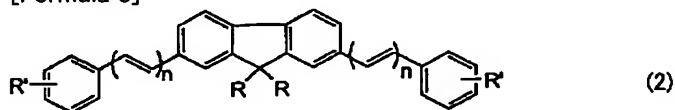
[0022] Radical; -B (OH) which comes out and is guided from an anhydride as shown 2, amino, nitroglycerine, the cyano ** formyl, SHIANATO, -COCl, and -CONHNH2 are mentioned.

[0023] According to this invention, the maximum wavelength of photo luminescence can use preferably what is 300-600nm among the fluorene system compounds containing the above-mentioned functional group. Moreover, the fluorene system compound containing the above-mentioned functional group can be used as a luminescent material for the luminous layer of an EL element.

[0024] The fluorene system polymer concerning this invention includes the product by the polymerization of the fluorene system compound concerning this invention different identically or mutually shown by the following formula (2), and/or the product by the polymerization of the fluorene system compound concerning this invention, and other organic compounds.

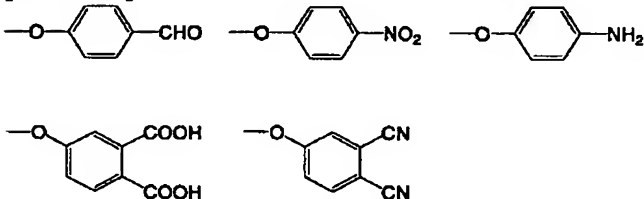
[0025]

[Formula 8]



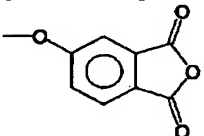
[0026] In a formula (2), n is 0 or 1. Moreover, it will not be limited, especially if manufacture is easy and excellent in EL property as a functional group shown by R and R'. For example, as R, what was illustrated about the above-mentioned formula (1) is applied. For example, R' is not limited to these, although it is the functional group which exists in meta or a para position to a phenyl group and the ether, ester, an amide, imide, a ketone, a sulfone, a sulfide, ethynyl, diethynyl one, vinyl, hydrazide, urea, carbamoyl, a carbonate, azomethine, a quinoline, OKISA diazole, azo, etc. are included as an example. Alkenyl; ethynyl like alkoxy; vinyl like cyano alkyl; methoxy like hydroxyalkyl; -CH2CN like halo alkyl; -CH2OH like alkyl; -CH2Cl like hydroxy; -Br and halogen; CH3 like -F as a desirable example of R' including these, alkyl carbonyl like alkoxy carbonyl; acetyl like alkynyl; carboxyl; ethoxycarbonyl like diethynyl one; it is following radical: [0027].

[Formula 9]



[0028] Radical of; following which comes out and is guided from a ether group as shown : [0029]

[Formula 10]



[0030] Radical; -B (OH) which comes out and is guided from an anhydride as shown 2, cyano ** amino, nitroglycerine, the formyl, SHIANATO, -COCl, and -CONHNH2 are mentioned.

[0031] If an inorganic acid or an organic acid is added in the case of the fluorene polymer with which said functional group contains an atom like nitrogen (when azomethine, a quinoline frame, etc. are included), while a salt as shown in [P-1-1] or [P-1-2] will be generated, for example, UV and the PL maximum wavelength change. For example, when a hydrochloric acid is added to [P-1] of an azomethine frame content fluorene polymer, the UV maximum wavelength changes to 355nm from 370nm, and that (photo luminescence was not seen) in which the PL maximum wavelength did not appear comes to emit light by 411nm.

[0032] Moreover, this invention is a salt generated when an acid is added to the above-mentioned fluorene system polymer, and these acid addition salts are desirable. As for an acid, it is desirable that they are an inorganic acid or an organic acid. As for an inorganic acid or an organic acid, it is desirable that they are a hydrochloric acid or p-toluene sulfide. Moreover, p-toluenesulfonic acid is also desirable. as the fluorene system polymer which it is desirable that it is the acid addition salt of the fluorene system polymer which has azomethine, a quinoline, or an imide frame, and has these frames — polyazo methine, for example as shown in (P-1), and the poly quinoline as

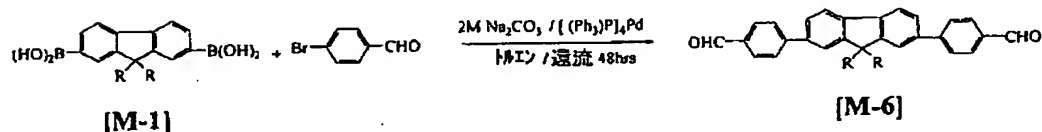
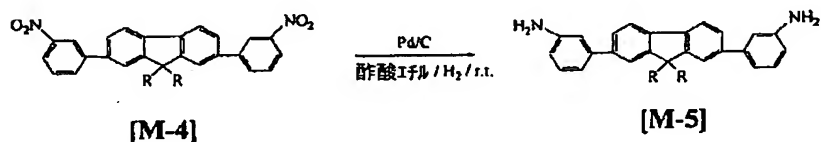
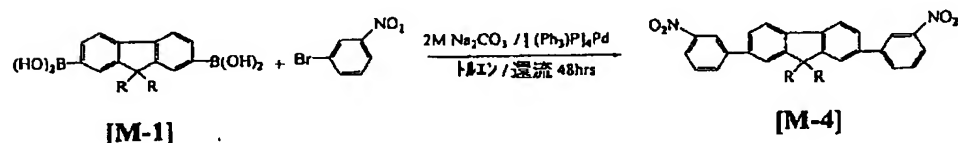
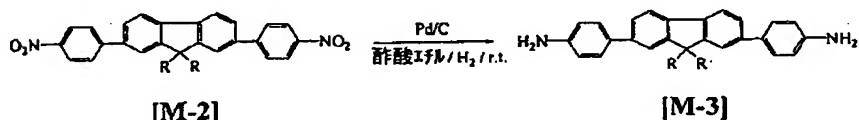
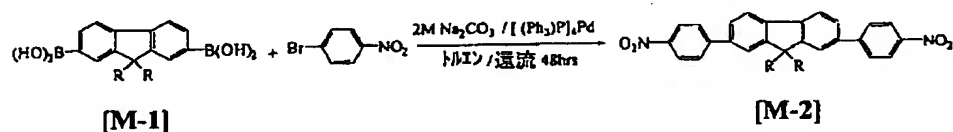
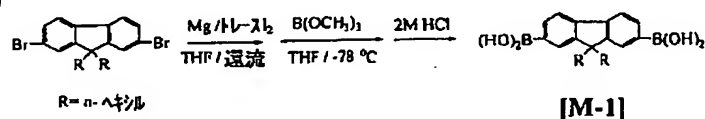
shown in (P-18) — or — and (P-19) — polyimide [like] is mentioned for or (P-30).

[0033] The acid addition salt of the fluorene system compound of this invention, a fluorene system polymer, and a polymer can be used as a luminescent material for the luminous layer of an EL element. Moreover, to the luminescent material of a luminous layer, it is desirable that they are the macromolecule which includes a polyvinyl carbazole, Pori (1, 4-hexyloxy - 2, 5-phenylenevinylene), or Pori (3-hexyl thiophene), and the EL element with which one or more sorts of the acid addition salt of a fluorene system compound, a fluorene system polymer, and a polymer are blended, and it is desirable to it that it is the EL element with which these macromolecules and a fluorene system polymer are blended especially.

[0034] The fluorene system compound (monomer) concerning this invention and its polymer can be manufactured by approach like the following reaction formula.

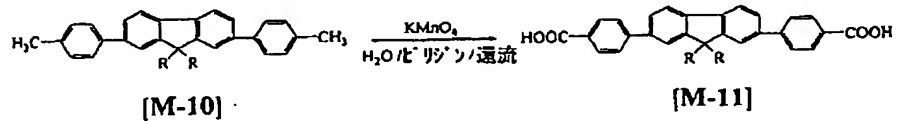
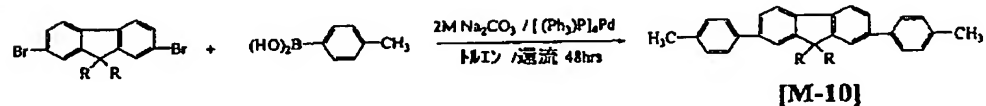
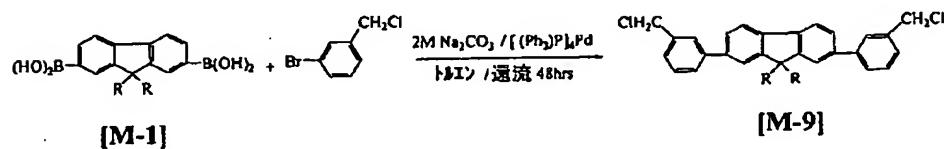
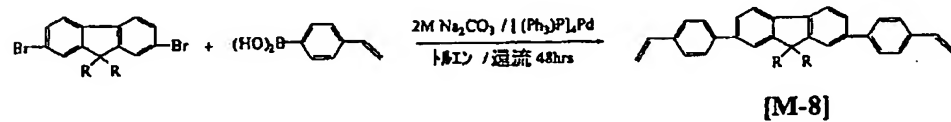
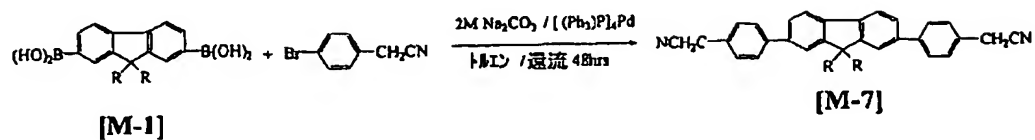
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[Formula 11]



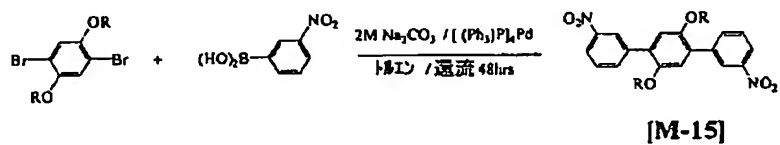
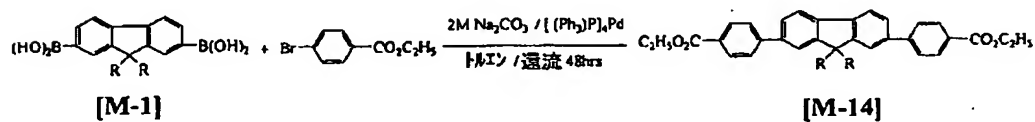
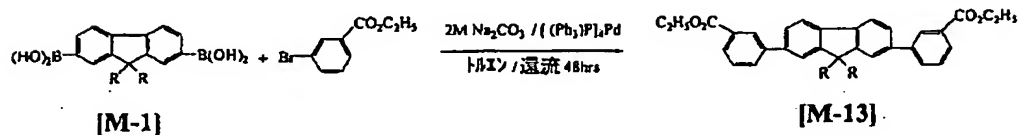
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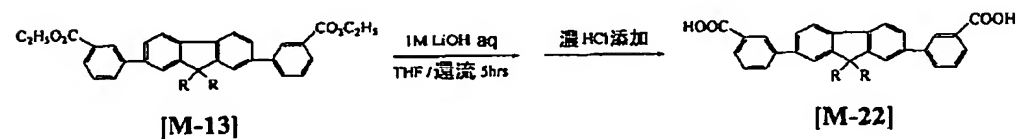
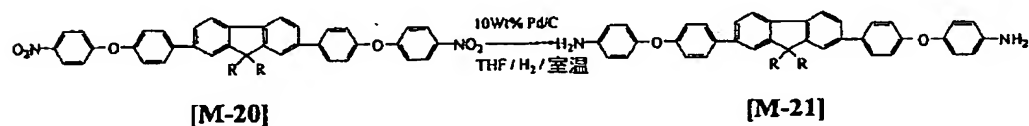
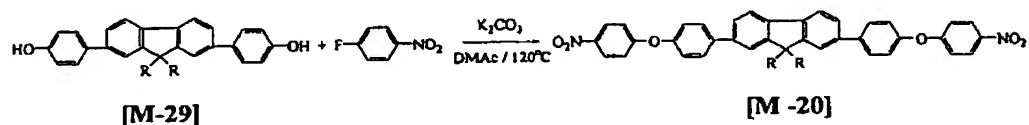
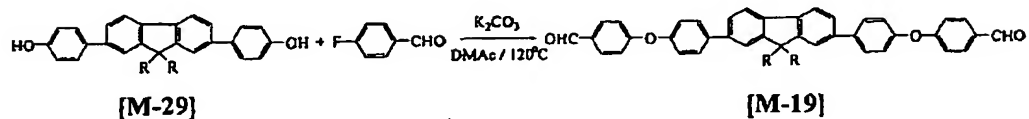
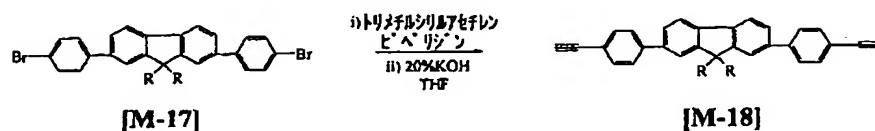
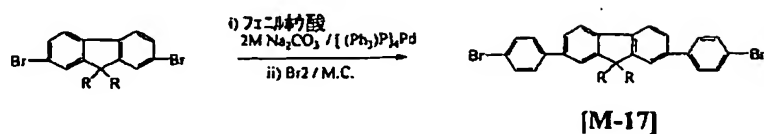


[0037]

[Formula 13]

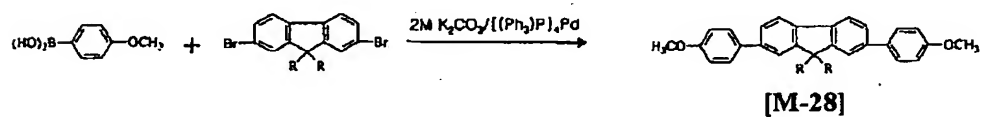
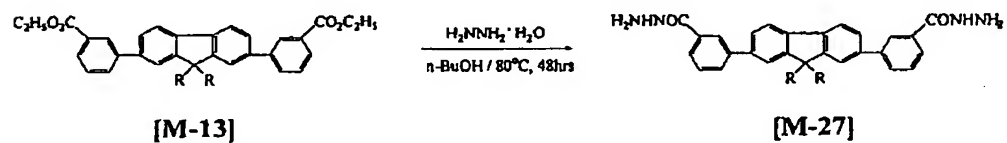
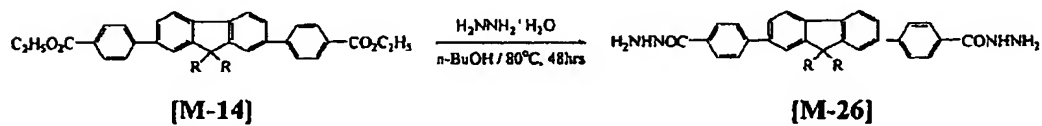
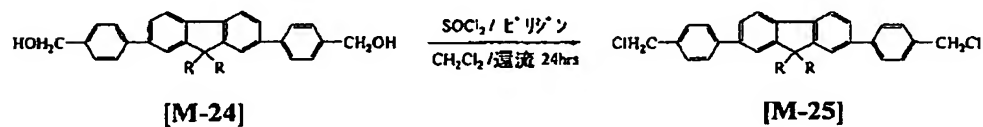
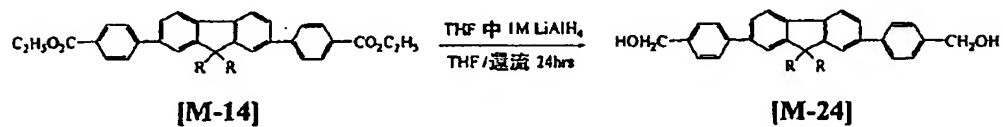
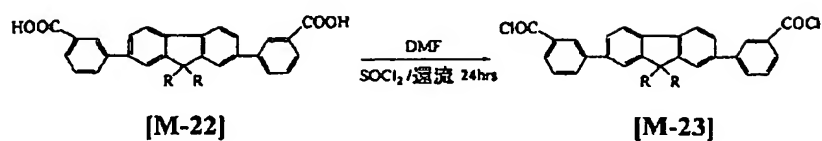


[0038]
[Formula 14]



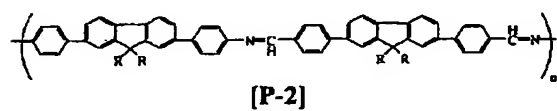
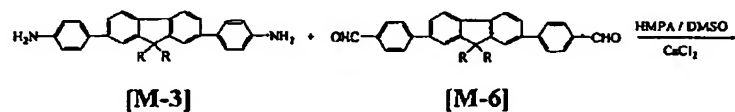
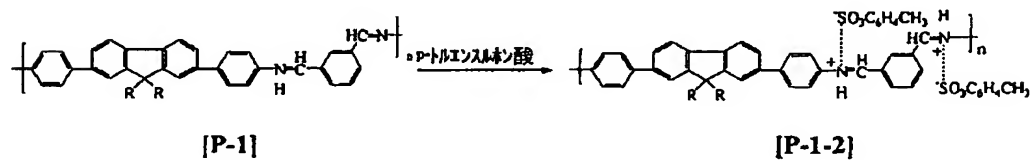
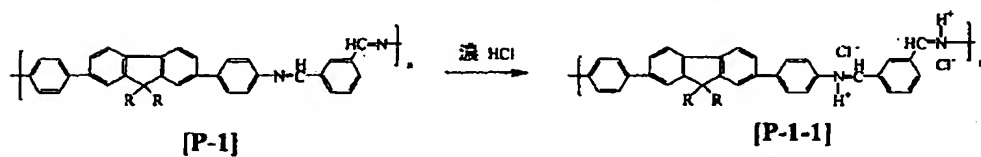
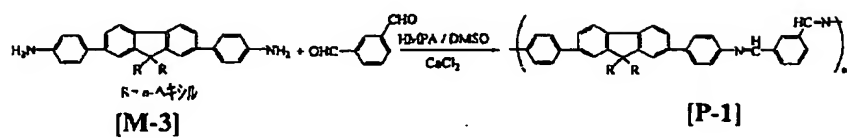
[0039]

[Formula 15]



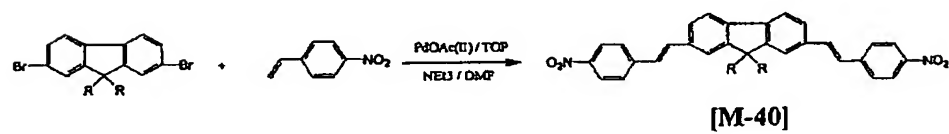
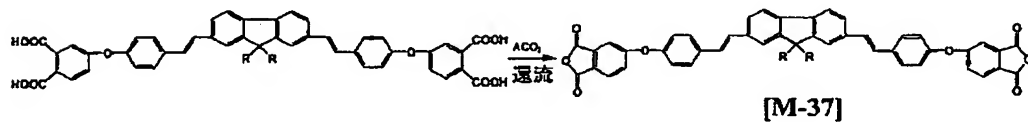
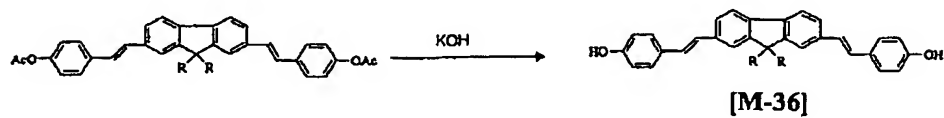
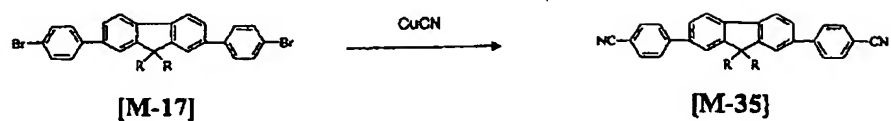
[0040]

[Formula 16]

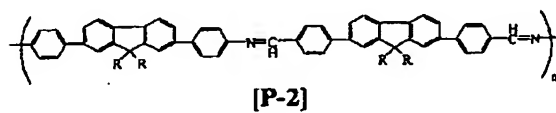
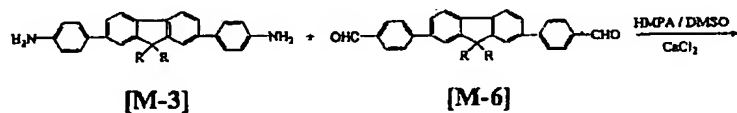
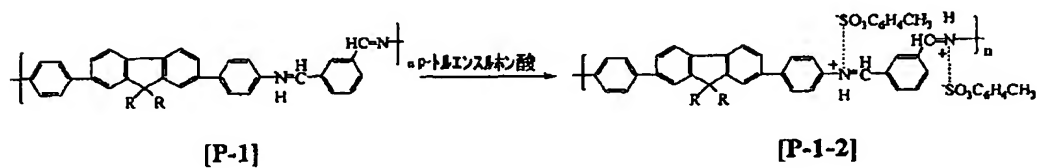
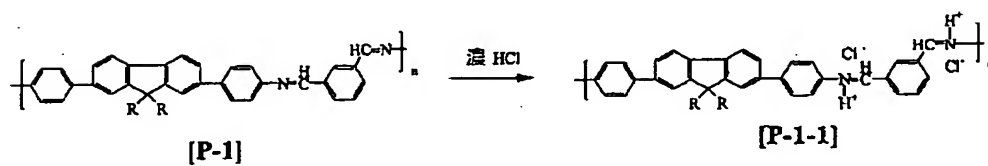
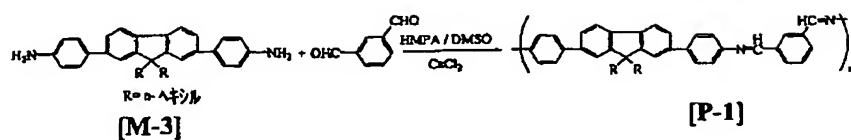


[0041]

[Formula 17]

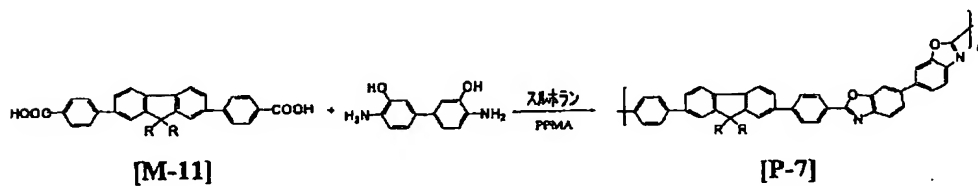
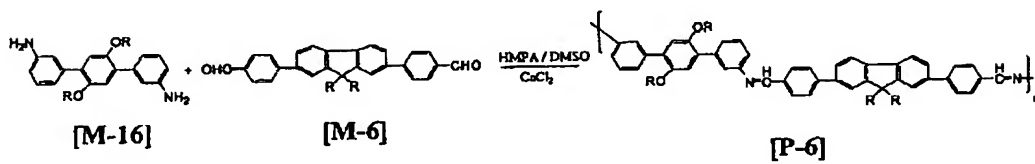
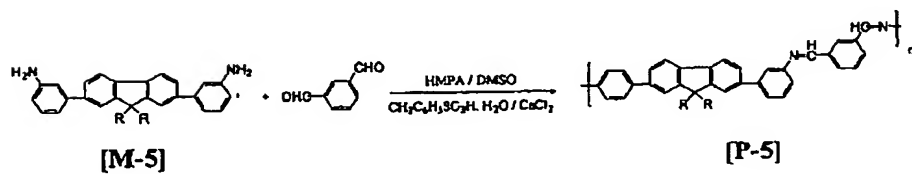
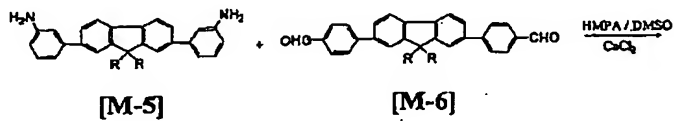
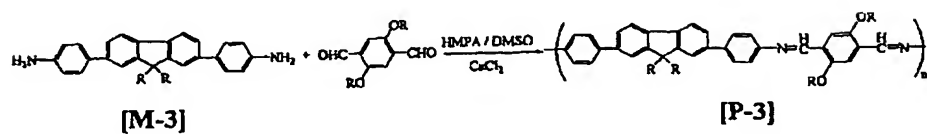


[0042]
[Formula 18]



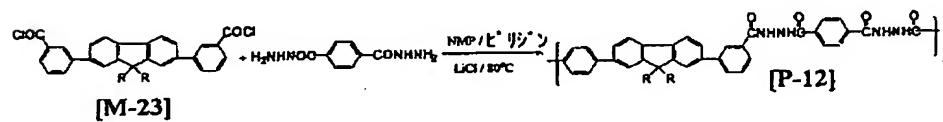
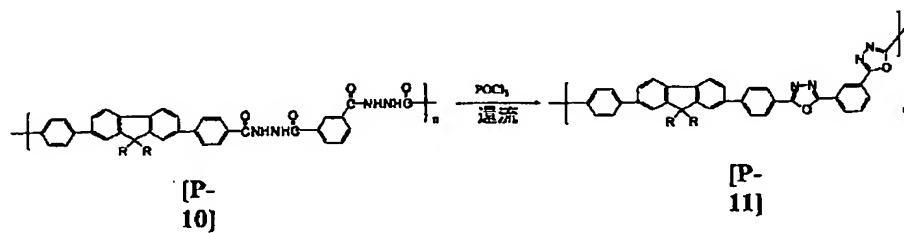
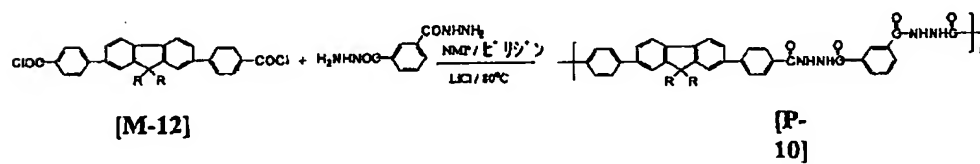
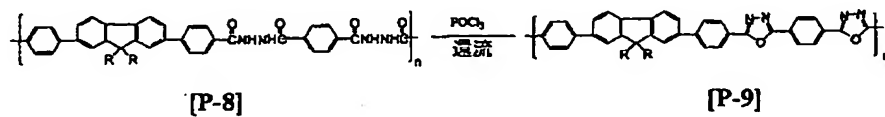
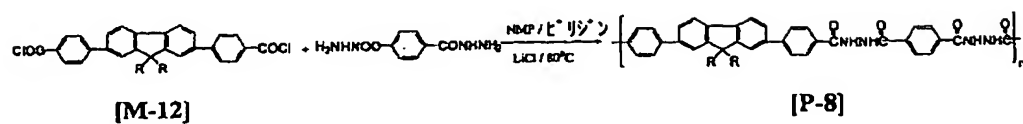
[0043]

[Formula 19]



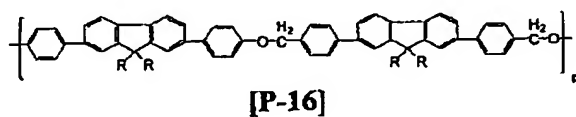
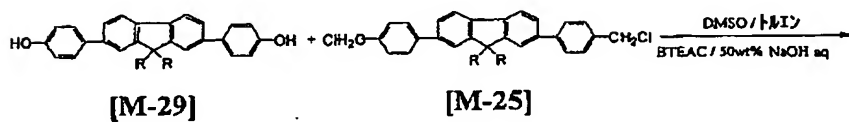
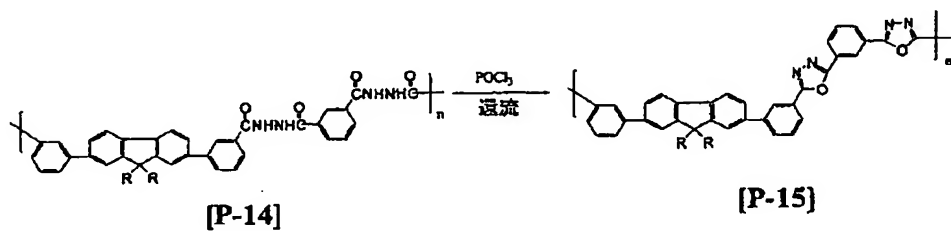
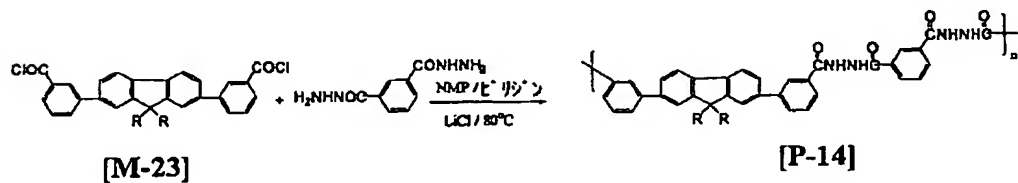
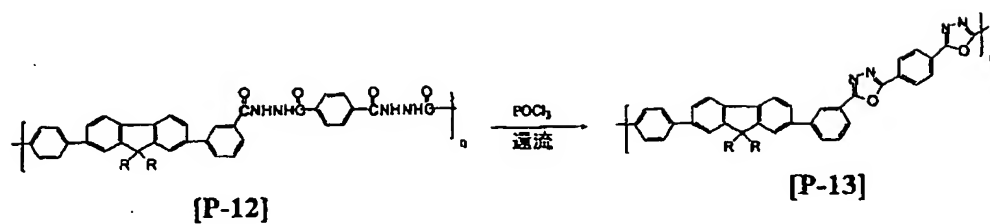
[0044]

[Formula 20]



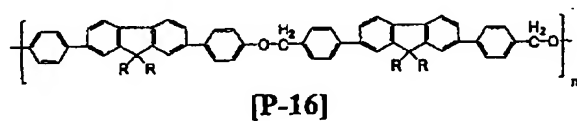
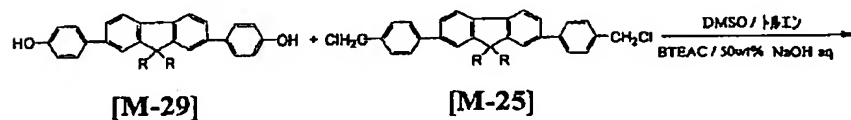
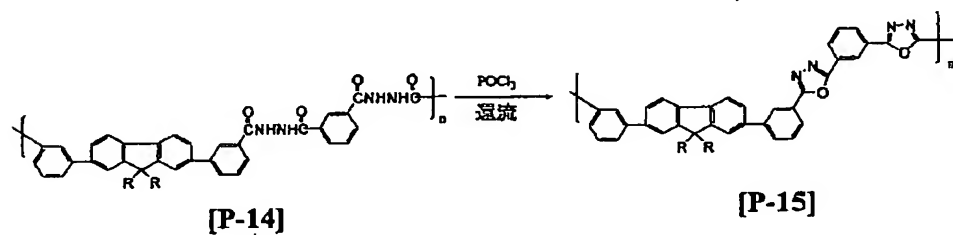
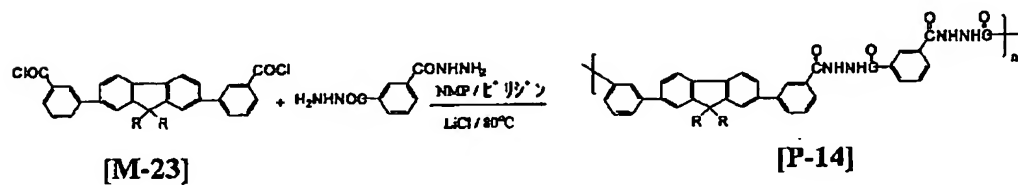
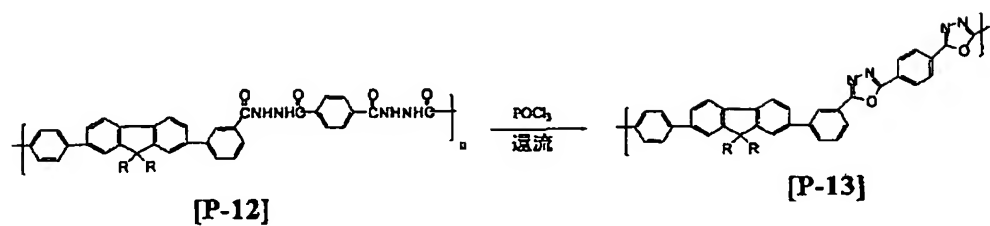
[0045]

[Formula 21]



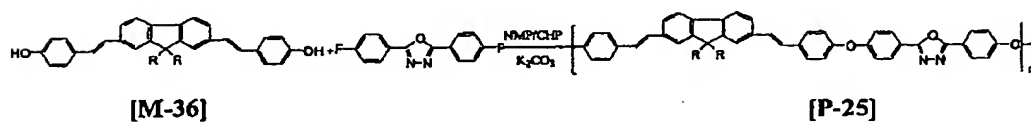
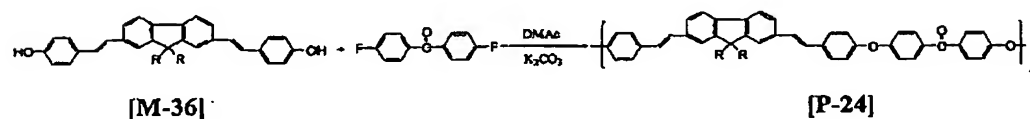
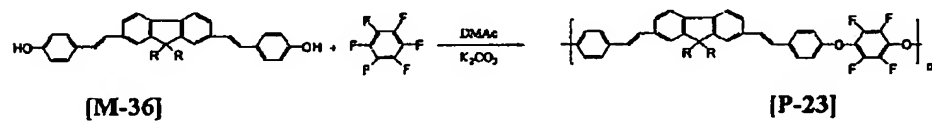
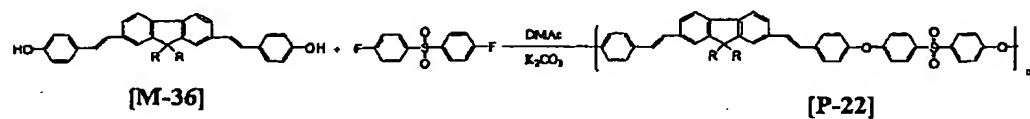
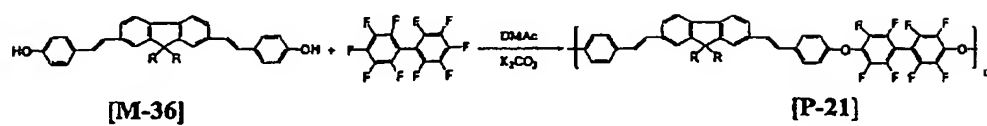
[0046]

[Formula 22]

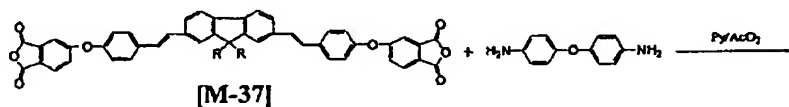
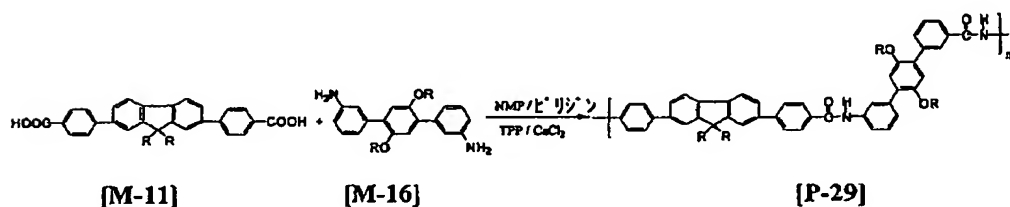
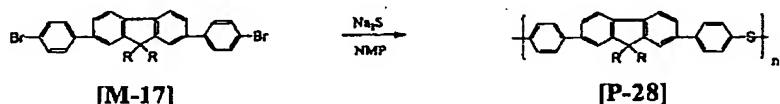
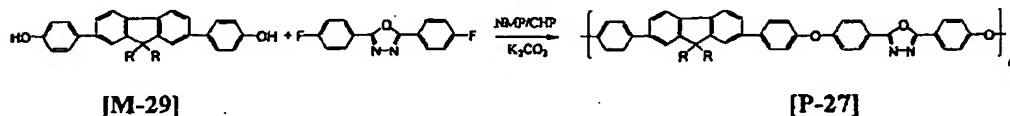
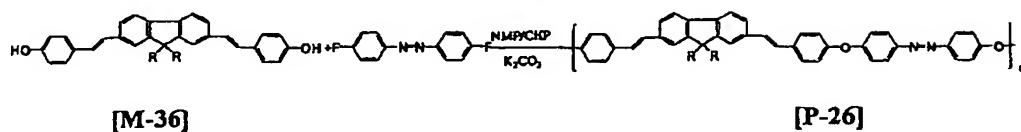


[0047]

[Formula 23]



[0048]
[Formula 24]



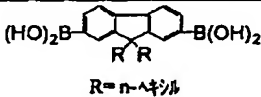
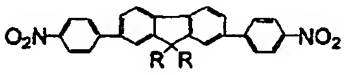
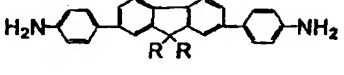
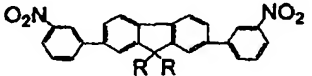
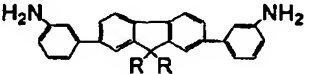
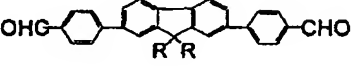
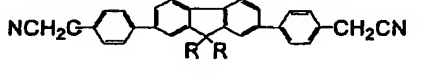
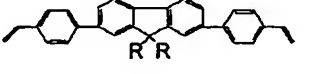
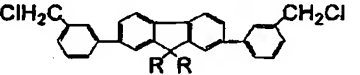
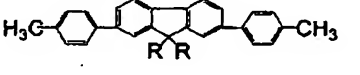
[0049] In addition, as long as the structure of the last matter other than an approach which was mentioned above is the same, what kind of well-known approach may be used for manufacture of the fluorene system compound concerning this invention, and/or its polymer. That is, it is not necessary to limit especially a solvent, reaction temperature, concentration, or a catalyst for manufacturing the fluorene system compound and/or polymer concerning this invention etc., and manufacture yield is not limited, either.

[0050] Those luminescence properties are shown in the structure list of other monomers to which the next table 1 uses a fluorene system compound and a fluorene system polymer in case R is n-hexyl group for generation. Examples 1-40 explain the check of those manufacture approaches and structure to a detail.

[0051]

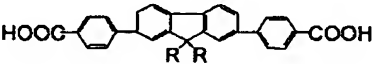
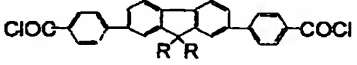
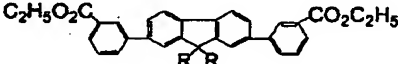
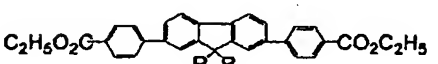
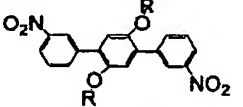
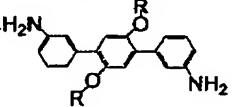
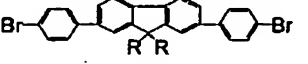
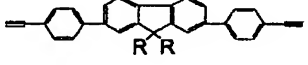
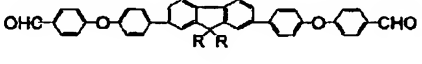
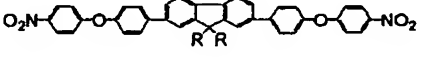
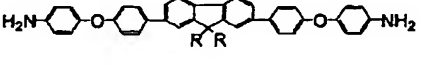
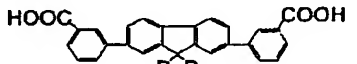
[Table 1]

表1

モノマー	構造 (R = n-ヘキシル)	UV(λ_{max}) (nm)	PL(λ_{max}) (nm)	融点(°C)
[M-1]	 R = n-ヘキシル	290 / 316	334	188-191
[M-2]		374	-	134-136
[M-3]		344	397	79-80
[M-4]		362	-	128-129
[M-5]		333	386	135-136
[M-6]		354	428	120-121
[M-7]		330	367/383	104-105
[M-8]		344	388/407	108-107
[M-9]		328	386/405	97-98
[M-10]		332	374	88-89

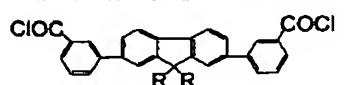
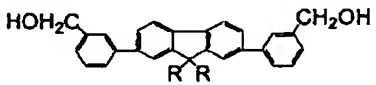
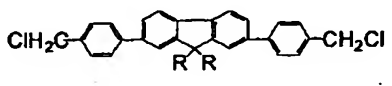
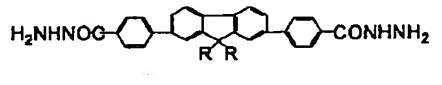
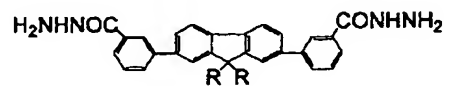
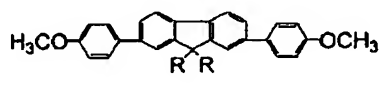
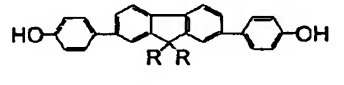
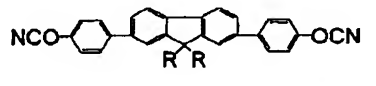
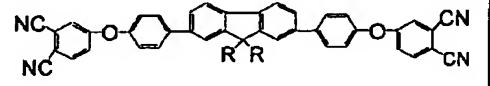
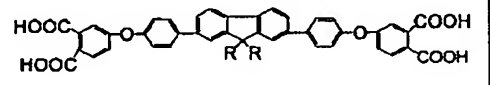
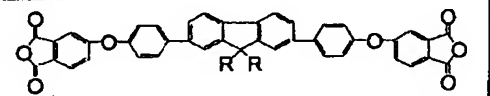
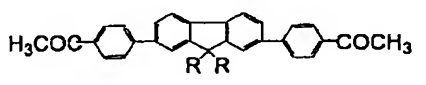
[0052]

[Table 2]

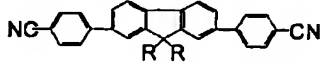
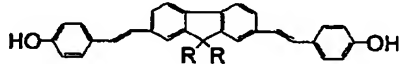
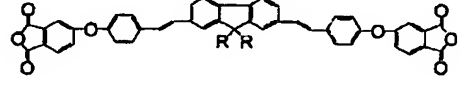
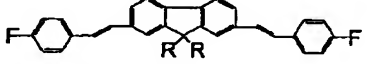
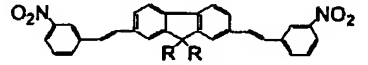
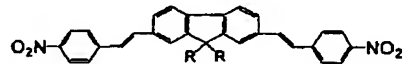
モノマー	構造 (R = n-ヘキシル)	UV(λ_{max}) (nm)	PL(λ_{max}) (nm)	融点(°C)
[M-11]		344	394	290-293
[M-12]		364	432	130-131
[M-13]		330	388/382	94-95
[M-14]		344	390/406	100-101
[M-15]		328	-	128-127
[M-16]		320	390	105-106
[M-17]		332	368/386	12-123
[M-18]		340	382	101-102
[M-19]		334	376/482	86-88
[M-20]		334	-	102-103
[M-21]		335	375/393	57-58
[M-22]		330	404	227-229

[0053]

[Table 3]

モノマー	構造 (R = n-ヘキシル)	UV(λ_{max}) (nm)	PL(λ_{max}) (nm)	融点(°C)
[M-23]		326	445	113-114
[M-24]		330	368/386	58-59
[M-25]		334	438	104-105
[M-26]		343	406	134-136
[M-27]		332	370/386	106-108
[M-28]		334	372/388	104-105
[M-29]		340	397	142-143
[M-30]		330	365/380	125-126
[M-31]		332	364	183-184
[M-32]		350	414	214-215
[M-33]		332	374	187-188
[M-34]		350	414	130-131

[0054]
[Table 4]

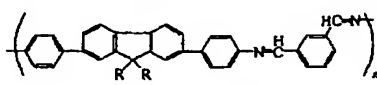
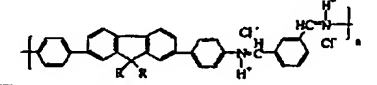
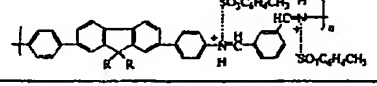
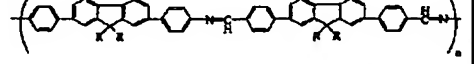
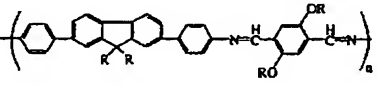
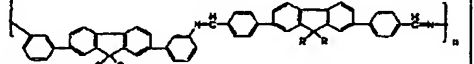
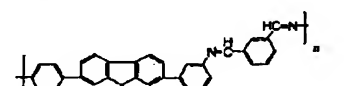
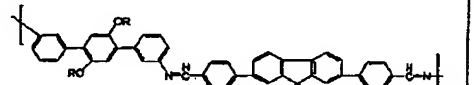
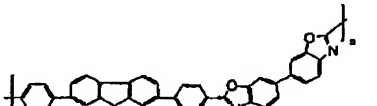
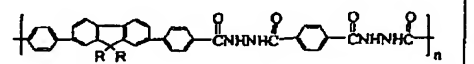
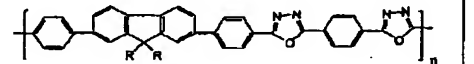
モノマー	構造 (R = n-ヘキシル)	UV(λ_{max}) (nm)	PL(λ_{max}) (nm)	融点(°C)
[M-35]		342	389/404	113-115
[M-36]		378	415/438	98-97
[M-37]		380	429	190-193
[M-38]		372	407/430	110-111
[M-39]		376	-	189-192
[M-40]		374	-	164-166

[0055] The next table 2 shows the structures and those luminescence properties of a fluorene system polymer in case R is n-hexyl group. Examples 41-66 explain the check of those manufacture approaches and structure to a detail.

[0056]

[Table 5]

表2

重合体	構造 (R=n-キシル)	UV(λ_{max}) (nm)	PL(λ_{max}) (nm)	$M_w \times 10^{-3}$	P.D.I.
[P-1]		370	-	19.9	2.54
[P-1-1]		355	411	-	-
[P-1-2]		348	418	-	-
[P-2]		380	-	10.7	2.49
[P-3]		333	375	9.6	1.82
[P-4]		360	-	19.2	2.44
[P-5]		320	-	18.6	3.61
[P-6]		362	425	4.8	1.88
[P-7]		-	-	-	-
[P-8]		344	400	10.5	1.9
[P-9]		356	454	-	-

[0057]
[Table 6]

重合体	構造 (R= n-ヘキシル)	UV(λ_{max}) (nm)	PL(λ_{max}) (nm)	$M_n \times 10^{-3}$	P.D.I.
[P-10]		344	407	11.7	2.0
[P-11]		358	432	-	-
[P-12]		334	386	12.3	2.1
[P-13]		333	490	-	-
[P-14]		334	379	12.7	1.7
[P-15]		326	398	-	-
[P-16]		338	378/392	89.0	2.6
[P-17]		334	448/475	76.2	2.4
[P-18]		374	431	40.3	3.38
[P-19]		334	367	$\eta_{inh} \approx 1.2 \text{ dl/g}$ (30°C, 0.5g/dl, NMP)	-
[P-20]		330	366/383	29.9	2.53

[0058]

[Table 7]

重合体	構造 (R=n-ヘキシル)	UV(λ_{max}) (nm)	PL(λ_{max}) (nm)	$M_w \times 10^{-3}$	P.D.I.
[P-21]		378	415/438	258.8	3.57
[P-22]		380	417/443	100.9	3.8
[P-23]		378	417/438	98.8	6.24
[P-24]		380	418/442	28.2	2.66
[P-25]		380	417/440	235.3	3.95
[P-26]		384	418/443	13.7	2.28
[P-27]		338	373/389	185.2	3.34
[P-28]		346	395	5.8	1.86
[P-29]		342	407	$\eta_{inh}=0.6dl/g$ (30°C, 0.5g/dl, DMAc)	-
[P-30]		382	-	$\eta_{inh}=1.07dl/g$ (30°C, 0.5g/dl, NMP)	-

[0059] The luminescence property shown in said Table 1 and 2 was measured by the approach explained in Example 67, and the same approach.

[0060] Organic [concerning this invention] and a macromolecule system EL element, and/or other optical elements are manufactured as a main ingredient for luminescence using the fluorene system compound which has various structures and functional groups as shown in said Table 1 and 2, and its polymer.

[0061] The fluorene system compound and/or polymer concerning this invention can already be used as an EL ingredient as it is by thin film-ization using well-known approaches, such as vacuum deposition, spin coating, roll coating, bar coating, and ink jet coating. The method with which the configuration of an EL element locates the usual luminous layer ingredient between an anode plate and cathode, namely, the gestalt of the most typical component of an anode plate / luminous layer / cathode — in addition, the ingredient (the Japanese patent application public presentation Taira No. 135361 [two to] official report —) of an electron hole transfer layer or an electron transport layer Together, it constitutes using this Taira No. 152184 [three to] official report, and this Taira No. 207170 [six to] official report, namely, all gestalten like an anode plate / electron hole transfer layer / luminous layer / electron transport layer / cathode are not included, and it is not restricted to especially a configuration method.

[0062] An organic-semiconductor compound like metals, such as ITO, gold, copper, tin oxide, and a zinc oxide, and a metallic oxide or polypyrrole, the poly aniline, and the poly thiophene is able to use the ingredient usually covered by the thickness of 10nm – 1 micrometer as electrode material for transparent support substrates, such as glass, a transparent plastic, and a quartz, as said anode plate here. Moreover, sodium, magnesium, calcium, aluminum, an indium, silver, gold and metallic materials like copper, or those quality of an alloy can be used as said cathode.

[0063] When a concrete example is given, as said electron hole transfer layer A polyvinyl carbazole, 2, 5-screw (4'-diethylaminophenyl) – 1, 3, and 4-OKISA diazole or N, N'-diphenyl-N, N'-(3-methylphenyl)-1, and 1'-biphenyl-4,4'-

diamine (TPD) etc. as said electron transport layer tris (8-hydroxyquinolate) aluminum and 2-(4'-tert-buthylphenyl)-5-(4''-biphenyl)- 1, 3, and 4-OKISA diazole — or 2, 4, and 7-trinitro-9-full — me — a well-known compound like non — vacuum evaporation technique, spin coating, casting, and LB — it can be used using the well-known thin film formation approaches, such as law, being able to apply.

[0064] In addition, the polymer which is applied to said electron hole transfer layer, an electron transport layer, or this invention in the luminescent material concerning this invention and which carries out mutual difference, Or it is also possible to use it, blending with PPV of fusibility and an existing luminescence polymer like a PTh derivative. For example, a polyvinyl carbazole, Pori (1, 4-hexyloxy - 2, 5-phenylenevinylene), or Pori (3-hexyl thiophene) etc., The polymer concerning this invention can be used applying it by spin coating or the casting approach, after making it dissolve in an organic solvent like chloroform. Although it is not necessary to limit especially, to a polyvinyl carbazole, the concentration at this time adjusts the luminescence giant molecule concerning this invention so that it may become 0.1 - 50% preferably 0.001 to 99%, and as 5nm - 5 micrometers of thickness of a thin film are preferably set to 50nm - 1 micrometer, it can be used further.

[0065] Moreover, the light emitting device concerning this invention and the macromolecule which is dissolved in a common organic solvent and can form a thin film, It is also possible to blend and use it in the range of the concentration mentioned above and thickness. As an usable macromolecule For example, the poly methyl (meta) acrylate, Pori (meta) acrylate, Polystyrene, a polycarbonate, a polyvinyl chloride, polyethylene, Polypropylene, a polyacrylonitrile, a polyvinyl pyrrolidone, polyvinyl alcohol, Polyvinyl acetate, a polyvinyl butyral, a polyvinyl amine, The poly caprolactone, polyethylene terephthalate, polybutylene terephthalate, Polyurethane, ABS, polysulfone, and thermoplastic plastics like the Pori fluoride [vinyl] object, Or a furan, a melamine, a phenol, silicone, epoxy, and general-purpose resin like nylon (trademark) are included by polyester, such as polyacetal, a polyamide, polyimide, and alkyd resin, polyurea, and the list.

[0066]

[Example] Hereafter, this invention is not restricted by these examples although this invention is more concretely explained based on an example.

[0067] The synthetic example 19 of a monomer, the 9'-G n-hexyl fluorene -2, the synthetic agitator of 7-JIBORETO (M-1), In the three-lot flask of 1 liter capacity equipped with the thermometer and the reflux capacitor 60.0g (0.12 mols) 2 and 7-dibromo -9, a 9'-dihexyl fluorene, and 11.9g (0.49 mols) magnesium are put in under an argon ambient atmosphere. After dissolving in a 400ml tetrahydrofuran (THF), added a small amount of iodine, it was made to flow back at 70 degrees C for 6 hours, and the Grignard reagent of transparent brown was obtained. subsequently, anhydrous, after adding 38.0g (0.36 mols) trimethyl borate [B(OCH₃)₃] in the 2l. flask of three lots with which the mechanical agitator was installed and making it cool with dry ice — after dropping said Grignard reagent at the solution dissolved in THF gradually and making it agitate at -78 degrees C for 2 hours, it agitated for two days in ordinary temperature. Subsequently, after adding gradually 500ml of solution of hydrochloric acid of 2M to said mixed solution, it agitated for 3 hours and the solution of transparent yellow was obtained. Subsequently, after diethylether's having extracted said solution 3 times and drying this extract with a magnesium sulfate anhydride, it filtered, the solvent was removed and the solid-state of dark brown was obtained. Subsequently, after having made the acetone/hexane (20:80) recrystallize said solid-state, obtaining the solid-state of a snow-white color and filtering this solid-state, it was made to fully dry in 40-degree C vacuum oven, and the 30g (58.8% of yield) product was obtained. The melting point was 188-189 degrees C.

1 H-NMR (DMSO-d₆), delta 0.42 (br, 6H, CH₃), 0.61-0.91 (t, 16H, CH₂), 1.9 (br, s, 4H, CCH₂), 7.73-7.81 (d, 6H, aromatic series), 8.04 (s, 4H, OH) [0068] Example 22, 7-screw - (4-nitrophenyl) The synthetic agitator of a -9 and 9'-G n-hexyl fluorene (M-2), In the three-lot flask of 500ml ** equipped with the thermometer and the reflux capacitor The bottom of an argon ambient atmosphere, the 5.0g (11.8mmol) 9 and 9'-G n-hexyl fluorene -2, 7-JIBORETO, 5.26g (26.0mmol) 4-BUROMO nitrobenzene (BrC₆H₄NO₂) and 0.3g (0.26mmol) tetrakis(triphenyl phosphine)palladium [(PPh₃)₄] (O) Pd are put in, and it dissolves in 140ml toluene — making — further — 2M — The 65ml sodium-carbonate solution was added and it was made to flow back for 48 hours. Subsequently, after it reduced temperature to the room temperature after the completion of a reaction and toluene extracted 3 times, rinsed the extract several times and it was made to dry with a magnesium sulfate anhydride, it filtered, and after the mixed solvent of a hexane/methylene chloride (1:1) refined the liquid with the viscosity which removed and obtained the solvent using the silica gel column, it was made to recrystallize with the mixed solvent of ethyl acetate/hexane, and the detailed yellow crystal was obtained. Subsequently, the obtained crystal was fully dried in 40-degree C vacuum oven, and the 5g (73.2% of yield) product was obtained. The melting point was 134-136 degrees C.

1 H-NMR (CDCl₃), delta 0.72-1.12 (m, 22H, CH₂ and CH₃), 2.04-2.12 (m, 4H, CCH₂), 7.62-7.81 (m, 14H, aromatic series) [0069] In the two-lot flask of 500ml ** equipped with Example 32, the 7-screw (4-aminophenyl) -9, and the synthetic agitator of a 9'-G n-hexyl fluorene (M-3) After putting in 4.0g (6.9mmol) 2 and the 7-screw (4-nitrophenyl) -9, a 9'-G n-hexyl fluorene, and 10wt(s)% activated carbon support palladium (Pd/C) 1g and making it dissolve in 50ml ethyl acetate, It was made to react in ordinary temperature for 24 hours, making it filled up with hydrogen gas. Subsequently, after the methylene chloride solvent refined the liquid with the viscosity which removed and obtained the solvent after the reaction was completed, and putting in a magnesium sulfate anhydride, making it dry and filtering using the silica gel column, it was made to recrystallize with a methanol and the detailed white crystal was obtained. Subsequently, the obtained crystal was fully dried in 40-degree C vacuum oven, and the 2.2g (65.0% of yield) product was obtained. The melting point was 79-81 degrees C.

1 H-NMR (CDCl₃), delta 0.72-1.15 (m, 22H, CH₂ and CH₃) and 1.96- 2.04 (m, 4H, CCH₂), 3.67 (Br, s, 4H, NH₂), and

6.76–7.72 (m, 14H, aromatic series) [0070] Example 42, the 7-screw (3-nitrophenyl) –9, the synthetic mechanical agitation machine of a 9'-G n-hexyl fluorene (M-4), In the three-lot flask of 1 liter capacity equipped with the thermometer and the reflux capacitor The bottom of an argon ambient atmosphere, 40.0g (81.3mmol) 2 and 7-dibromo –9, a 9'-G n-hexyl fluorene, 29.8g (0.178mmol) 3-nitrobenzene borate (O2NC6H4B(OH)2) and 0.93g (0.81mmol) tetrakis(triphenyl) phosphinepalladium are put in, and it dissolves in 300ml toluene — making — further — 2M — The 150ml sodium-carbonate solution was added and it was made to flow back for 48 hours. Subsequently, after the mixed solvent of ethyl acetate/hexane (1:3) refined the liquid with the viscosity which removed and obtained the solvent after having rinsed the extract several times, having made it dry with a magnesium sulfate anhydride after it reduced temperature to the room temperature after the completion of a reaction and toluene extracted 3 times, and filtering using the silica gel column, it was made to recrystallize with the mixed solvent of ethyl acetate/hexane, and the detailed yellow crystal was obtained. Subsequently, the obtained crystal was fully dried in 40-degree C vacuum oven, and the 25g (53.3% of yield) product was obtained. The melting point was 135–136 degrees C.

1 H-NMR (CDCl3), delta0.72–1.13 (m, 22H, CH2 and CH3), 2.06–2.14 (m, 4H, CCH2), 7.62–8.56 (m, 14H, aromatic series) [0071] In the two-lot flask of 500ml ** equipped with Example 52, the 7-screw (3-aminophenyl) –9, and the synthetic agitator of a 9'-G n-hexyl fluorene (M-5) 9.0g (15.6mmol) 2 and the 7-screw (3-nitrophenyl) –9, a 9'-G n-hexyl fluorene, It was made to react in ordinary temperature for 24 hours, after putting in 10wt(s)% activated carbon support palladium (Pd/C) 1.5g and making it dissolve in 100ml ethyl acetate, making it filled up with hydrogen gas. After the mixed solvent of ethyl acetate/hexane (1:1) refined the liquid with the viscosity which removed and obtained the solvent after the reaction was completed, and putting in a magnesium sulfate anhydride, making it dry and filtering using the silica gel column, it was made to recrystallize with the mixed solvent of diethylether/methanol, and the white crystal was obtained. Subsequently, the obtained crystal was fully dried in 40-degree C vacuum oven, and the 6.5g (80% of yield) product was obtained. The melting point was 120–121 degrees C.

1 H-NMR (CDCl3), delta0.76–1.16 (m, 22H, CH2 and CH3) and 2.02– 2.10 (m, 4H, CCH2), 3.77 (br, s, 4H, NH2), and 6.72–7.79 (m, 14H, aromatic series) [0072] Example 62, the 7-screw (4-aldehyde phenyl) –9, the synthetic agitator of a 9'-G n-hexyl fluorene (M-6), In the three-lot flask of 500ml ** equipped with the thermometer and the reflux capacitor The bottom of an argon ambient atmosphere, the 5.0g (11.8mmol) 9 and 9'-G n-hexyl fluorene –2, 7-JIBORETO, After putting in 4.8g (26.0mmol) 4-BUROMO benzaldehyde (BrC6H4CHO) and 0.3g (0.26mmol) tetrakis(triphenyl) phosphinepalladium and making it dissolve in 140ml toluene, Furthermore, the sodium-carbonate solution (2M and 65ml) was added, and it was made to flow back for 48 hours. Subsequently, after the methylene chloride solvent refined the liquid with the viscosity which removed and obtained the solvent after having rinsed the extract several times, having made it dry with a magnesium sulfate anhydride after it reduced temperature to the room temperature after the completion of a reaction and toluene extracted 3 times, and filtering using the silica gel column, it was made to recrystallize with the mixed solvent of ethyl acetate/hexane, and the yellow crystal was obtained. Subsequently, the obtained crystal was fully dried in 40-degree C vacuum oven, and the 5.0g (77.8% of yield) product was obtained. The melting point was 128–129 degrees C.

1 H-NMR (CDCl3), delta0.71–1.12 (m, 22H, CH2 and CH3), 2.03–2.11 (m, 4H, CCH2), 7.62–8.02 (m, 14H, aromatic series), 10.08 (s, 2H, CHO) [0073] Example 72, the 7-screw (4-acetonitrile phenyl) –9, the synthetic agitator of a 9'-G n-hexyl fluorene (M-7), In the three-lot flask of 500ml ** equipped with the thermometer and the reflux capacitor The bottom of an argon ambient atmosphere, the 9.0g (16.58mmol) 9 and 9'-G n-hexyl fluorene –2, 7-JIBORETO, 7.15g (36.47mmol) 4-BUROMO phenylacetonitrile (BrC6H4CH2CN) and 0.42g (0.36mmol) tetrakis(triphenyl) phosphinepalladium are put in, and it dissolves in 180ml toluene — making — further — 2M — The 90ml sodium-carbonate solution was added and it was made to flow back for 48 hours. Subsequently, after the mixed solvent of ethyl acetate/hexane (1:2) refined the liquid with the viscosity which removed and obtained the solvent after having rinsed the extract several times, having made it dry with a magnesium sulfate anhydride after it reduced temperature to the room temperature after the completion of a reaction and toluene extracted 3 times, and filtering using the silica gel column, it was made to recrystallize with the mixed solvent of ethanol/chloroform, and the yellow crystal was obtained. Subsequently, the obtained crystal was fully dried in 40-degree C vacuum oven, and the 4.7g (50% of yield) product was obtained. The melting point was 104–105 degrees C.

1 H-NMR (CDCl3), delta0.72–1.07 (m, 22H, CH2 and CH3) and 2.01– 2.18 (m, 4H, CCH2), 3.83 (s, 4H, CH2CN), and 7.42–7.81 (m, 14H, aromatic series) [0074] Example 82, the 7-screw (4-vinyl phenyl) –9, the synthetic agitator of a 9'-G n-hexyl fluorene (M-8), In the three-lot flask of 500ml ** equipped with the thermometer and the reflux capacitor The bottom of a nitrogen argon ambient atmosphere, 20.0g (40.6mmol) 2 and 7-dibromo –9, a 9'-G n-hexyl fluorene, 13.3g (89.4mmol) 4-vinyl phenyl borate [H2C=CHC6H4B(OH)2] and 0.46g (0.4mmol) tetrakis(triphenyl) phosphinepalladium are put in, and it dissolves in 200ml toluene — making — further — 2M — The 100ml sodium-carbonate solution was added and it was made to flow back for 48 hours. Subsequently, after the mixed solvent of ethyl acetate/hexane (1:3) refined the liquid with the viscosity which removed and obtained the solvent after having rinsed the extract several times, having made it dry with a magnesium sulfate anhydride after it reduced temperature to the room temperature after the completion of a reaction and toluene extracted 3 times, and filtering using the silica gel column, it was made to recrystallize with the mixed solvent of ethyl acetate/hexane, and the yellow crystal was obtained. Subsequently, the obtained crystal was fully dried in 40-degree C vacuum oven, and the 16.0g (73% of yield) product was obtained. The melting point was 106–107 degrees C.

1 H-NMR (CDCl3), delta0.75–1.16 (m, 22H, CH2 and CH3), 2.04–2.12 (m, 4H, CCH2), 5.29–6.86 (m, 6H, vinyl), 7.53–7.82 (m, 14H, aromatic series) [0075] Example 92, the 7-screw (3-chloro methylphenyl) –9, the synthetic agitator of

a 9'-G n-hexyl fluorene (M-9), In the three-lot flask of 250ml ** equipped with the thermometer and the reflux capacitor The bottom of an argon ambient atmosphere, the 2.0g (4.7mmol) 9 and 9'-G n-hexyl fluorene -2, 7-JIBORETO, 2.14g (10.4mmol) 3-BUROMO benzyl chloride ($\text{BrC}_6\text{H}_4\text{CH}_2\text{Cl}$) and 0.12g (0.104mmol) tetrakis(triphenyl) phosphinepalladium are put in, and it dissolves in 50ml toluene — making — further — 2M — The 25ml sodium-carbonate solution was added and it was made to flow back for 48 hours. After the mixed solvent of ethyl acetate/hexane (1:3) refined the liquid with the viscosity which removed and obtained the solvent after having rinsed the extract several times, having made it dry with a magnesium sulfate anhydride after the reaction was completed, it reduced temperature to the room temperature and toluene extracted 3 times, and filtering using the silica gel column, it was made to recrystallize with the mixed solvent of ethyl acetate/hexane, and the cream-colored crystal was obtained. Subsequently, the obtained crystal was fully dried in 40-degree C vacuum oven, and the 1.2g (43.5% of yield) product was obtained. The melting point was 97-98 degrees C.

¹H-NMR (CDCl_3), δ 0.75-1.11 (m, 22H, CH_2 and CH_3) and 2.05- 2.13 (m, 4H, CCH_2), 4.73 (s, 4H, CH_2Cl), and 7.41-7.84 (m, 14H, aromatic series) [0076] Example 102, the 7-screw (tolyl) -9, the synthetic mechanical agitation machine of a 9'-G n-hexyl fluorene (M-10), In the three-lot flask of 1 liter capacity equipped with the thermometer and the reflux capacitor The bottom of nitrogen-gas-atmosphere mind, 40.0g (81.3mmol) 2 and 7-dibromo -9, a 9'-G n-hexyl fluorene, Put in 24.4g (0.18mmol) 4-tolyl borate [$\text{CH}_3\text{C}_6\text{H}_4\text{B}(\text{OH})_2$] and 0.94g (0.81mmol) tetrakis(triphenyl) phosphinepalladium, and it is made to dissolve in 400ml toluene. Furthermore, the sodium-carbonate solution (2M and 200ml) was added, and it was made to flow back for 48 hours. After the mixed solvent of ethyl acetate/hexane (1:2) refined the liquid with the viscosity which removed and obtained the solvent after having rinsed the extract several times, having made it dry with a magnesium sulfate anhydride after the reaction was completed, it reduced temperature to the room temperature and toluene extracted 3 times, and filtering using the silica gel column, it was made to recrystallize with the mixed solvent of ethyl acetate/hexane, and the cream-colored crystal was obtained. Subsequently, the obtained crystal was fully dried in 40-degree C vacuum oven, and the 36.1g (86% of yield) product was obtained. The melting point was 88-89 degrees C.

¹H-NMR (CDCl_3), δ 0.76-1.10 (m, 22H, CH_2 and CH_3) and 2.03- 2.11 (m, 4H, CCH_2), 2.46 (s, 6H, CH_3), and 7.31-7.82 (m, 14H, aromatic series) [0077] It was made to flow back, after putting 15.0g (29.1mmol) 2 and the 7-screw (tolyl) -9, and the 9'-G n-hexyl fluorene into the three-lot flask of 1 liter capacity equipped with Example 112, the 7-screw (4-carboxyl phenyl) -9, the synthetic agitator of a 9'-G n-hexyl fluorene (M-11), the thermometer, and the reflux capacitor and dissolving a 270ml pyridine in it. Subsequently, the 50ml boiling water was added to said solution, after adding having applied 13.8g (87.4mmol) potassium permanganate in 4 hours, it was made to flow back for 8 hours, and brown mixed liquor was obtained. Subsequently, the 350ml boiling water was added to said mixed liquor, further, after adding having applied 27.6g potassium permanganate in 6 hours, it was made to flow back for 12 hours, and brown mixed liquor was obtained. Subsequently, said mixed liquor was filtered in the hot condition, the boiling water washed several times, and the yellow solution was obtained. Subsequently, when concentrated hydrochloric acid was added small quantity every in said solution and white sediment was generated, after filtering and washing in cold water thoroughly, it was made to fully dry in 50-degree C vacuum oven, and the solid-state with a white of 11.7g (70% of yield) was obtained. The melting point was 290-293 degrees C.

¹H-NMR ($\text{DMSO}-d_6$), δ 0.53-0.96 (m, 22H, CH_2 and CH_3), 0.96-2.11 (m, 4H, CCH_2), 7.71-8.05 (m, 14H, aromatic series), 12.96 (br, s, 2H, COOH) [0078] Example 122, the 7-screw (4-chloro carbonyl phenyl) -9, the synthetic agitator of a 9'-G n-hexyl fluorene (M-12), In the three-lot flask of 50ml ** equipped with the thermometer and the reflux capacitor 6.0g (10.4mmol) 2 and the 7-screw (carboxyl phenyl) -9, and a 9'-G n-hexyl fluorene are put in under an argon ambient atmosphere. After adding the 30ml thionyl chloride (SOCl_2) and making it dissolve with heating, 1ml dimethylformamide (DMF) was added and it was made to flow back for 12 hours. Subsequently, after reducing said solution in ordinary temperature and removing a solvent completely under reduced pressure, it was made to separate into the part which adds diethylether and is dissolved, and the part which is not dissolved. Subsequently, after removing diethylether from the part dissolved in said diethylether completely, it was made to recrystallize with the mixed solvent of the petroleum ether/diethylether, and the yellow crystal was obtained. Subsequently, filtered the obtained crystal, it was made to fully dry in 40-degree C vacuum oven, and the 4.3g (67% of yield) product was obtained. The melting point was 130-131 degrees C.

¹H-NMR (CDCl_3), δ 0.71-1.12 (m, 22H, CH_2 and CH_3), 2.03-2.11 (m, 4H, CCH_2), 7.61-8.25 (m, 14H, aromatic series) [0079] Example 132, the 7-screw (3-ethyloxy carbonyl phenyl) -9, the synthetic agitator of a 9'-G n-hexyl fluorene (M-13), In the three-lot flask of 500ml ** equipped with the thermometer and the reflux capacitor The bottom of an argon ambient atmosphere, the 10.0g (23.7mmol) 9 and 9'-G n-hexyl fluorene -2, 7-JIBORETO, Put in a 11.9g (52.1mmol) ethyl-3-bromobenzo art and 0.6g (0.52mmol) tetrakis(triphenyl) phosphinepalladium, and it is made to dissolve in 260ml toluene. Furthermore, the sodium-carbonate solution (2M and 130ml) was added, and it was made to flow back for 48 hours. After the mixed solvent of ethyl acetate/hexane (1:3) refined the liquid with the viscosity which removed and obtained the solvent after having rinsed the extract several times, having made it dry with a magnesium sulfate anhydride after the reaction was completed, it reduced temperature to the room temperature and toluene extracted 3 times, and filtering using the silica gel column, it was made to recrystallize with the mixed solvent of ethanol/acetone, and the white crystal was obtained. Subsequently, the obtained crystal was fully dried in 40-degree C vacuum oven, and the 11g (73.8% of yield) product was obtained. The melting point was 94-95 degrees C.

¹H-NMR (CDCl_3), δ 0.70-1.06 (m, 22H, CH_2 and CH_3), 1.39-1.46 (t, 6H, CH_3), 2.00-2.08 (m, 4H, CCH_2), 4.37-4.48 (q, 4H, OCH_2), 7.50-8.35 (m, 14H, aromatic series) [0080] Example 142, the 7-screw (4-ethyloxy carbonyl

phenyl) -9, the synthetic agitator of a 9'-G n-hexyl fluorene (M-14), In the three-lot flask of 500ml ** equipped with the thermometer and the reflux capacitor The bottom of an argon ambient atmosphere, the 10.0g (23.7mmol) 9 and 9'-G n-hexyl fluorene -2, 7-JIBORETO, Put in a 11.9g (52.1mmol) ethyl-4-bromobenzo art and 0.6g (0.52mmol) tetrakis(triphenyl) phosphinepalladium, and it is made to dissolve in 260ml toluene. Furthermore, the sodium-carbonate solution (2M and 130ml) was added, and it was made to flow back for 48 hours. After the mixed solvent of ethyl acetate/hexane (1:3) refined the liquid with the viscosity which removed and obtained the solvent after having rinsed the extract several times, having made it dry with a magnesium sulfate anhydride after the reaction was completed, it reduced temperature to the room temperature and toluene extracted 3 times, and filtering using the silica gel column, it was made to recrystallize with the mixed solvent of ethanol/acetone, and the yellow crystal was obtained. Subsequently, the obtained crystal was fully dried in 40-degree C vacuum oven, and the 9g (60% of yield) product was obtained. The melting point was 100 degrees C.

1 H-NMR (CDCl₃), delta 0.72-1.05 (m, 22H, CH₂ and CH₃), 1.40-1.44 (t, 6H, CH₃), 2.00-2.08 (m, 4H, CCH₂), 4.38-4.45 (q, 4H, OCH₂), 7.58-8.14 (m, 14H, aromatic series) [0081] Example 151, the 4-screw (3-nitrophenyl) -3, the synthetic agitator of 6-G hexyloxy benzene (M-15), In the three-lot flask of 500ml ** equipped with the thermometer and the reflux capacitor The bottom of an argon ambient atmosphere, 20.0g (45.8mmol) 1 and 4-dibromo -3, 6-G hexyloxy benzene, Put in 16.8g (0.1 mols) 3-nitrobenzene borate (O₂NC₆H₄B(OH)₂) 2 and 0.53g (0.46mmol) tetrakis(triphenyl) phosphinepalladium, and it is made to dissolve in 200ml toluene. Furthermore, the sodium-carbonate solution (2M and 100ml) was added, and it was made to flow back for 48 hours. After the mixed solvent of ethyl acetate/hexane (1:3) refined the liquid with the viscosity which removed and obtained the solvent after having rinsed the extract several times, having made it dry with a magnesium sulfate anhydride after the reaction was completed, it reduced temperature to the room temperature and toluene extracted 3 times, and filtering using the silica gel column, it was made to recrystallize with the mixed solvent of ethyl acetate/hexane, and the detailed yellow crystal was obtained. Subsequently, the obtained crystal was fully dried in 40-degree C vacuum oven, and the 12g (50% of yield) product was obtained. The melting point was 126-127 degrees C.

1 H-NMR (CDCl₃), delta 0.87-1.77 (m, 22H, CH₂ and CH₃), 3.91-3.98 (m, 4H, OCH₂), 7.01-8.51 (m, 10H, aromatic series) [0082] In the two-lot flask of 500ml ** equipped with the synthetic agitator of Example 161, the 4-screw (3-aminophenyl) -3, and 6-G hexyloxy benzene (M-16) It was made to react in ordinary temperature for 24 hours, after putting in 9.0g (17.3mmol) 1 and the 4-screw (nitrophenyl) -3, 6-G hexyloxy benzene, and 10wt(s)% activated carbon support palladium (Pd/C) 2g and making it dissolve in 200ml THF, making it filled up with hydrogen gas. After the reaction was completed, and making it dry with a magnesium sulfate anhydride and filtering, the liquid with the viscosity which removed and obtained the solvent was made to recrystallize with the mixed solution of diethylether/methanol, and the white crystal was obtained. Subsequently, the obtained crystal was fully dried in 40-degree C vacuum oven, and the 7.0g (88% of yield) product was obtained. The melting point was 105-106 degrees C. 1 H-NMR (CDCl₃), delta 0.81-1.69 (m, 22H, CH₂ and CH₃), 3.57 (Br, s, 4H, NH₂), 3.83-3.89 (m, 4H, OCH₂), 6.62-7.24 (m, 10H, aromatic series) [0083] Example 172, the 7-screw (4-BUROMO phenyl) -9, the synthetic agitator of a 9'-G n-hexyl fluorene (M-17), In the three-lot flask of 1 liter capacity equipped with the thermometer and the reflux capacitor After putting in 50.0g (0.1 mols) 2 and 7-diphenyl -9, and a 9'-G n-hexyl fluorene and making it dissolve in a 400ml methylene chloride, When -5 degrees C is made to cool using iced water, it adds at a time further one drop of 33.6g (0.21 mols) bromine diluted with the 100ml methylene chloride and addition was completed, temperature was made into 25 degrees C and it was made to react for 24 hours. After dissolving a liquid with the viscosity which removed and obtained the solvent after having rinsed several times, having made it dry with a magnesium sulfate anhydride after the reaction was completed, and adding gradually 20% of potassium-hydroxide water solution and separating an organic layer until red reaction mixture was exhausted, and filtering in a hexane, -40 degrees C was made to cool and the solid-state was obtained. Subsequently, after having made said solid-state recrystallize twice by the hexane, obtaining the crystal of a snow-white color and filtering the obtained crystal, it was made to fully dry in 30-degree C vacuum oven, and the 55g (83.66% of yield) product was obtained. The melting point was 121-123 degrees C.

1 H-NMR (CDCl₃), delta 0.71-1.06 (m, 22H, CH₂, CH₃), 1.99-2.06 (m, 4H, CCH₂), 7.45-7.78 (m, 16H, aromatic series) [0084] In the 250ml flask equipped with the synthetic agitator and thermometer of Example 182, the 7-screw (4-ethynyl phenyl) -9, and a 9'-G n-hexyl fluorene (M-18) After putting in a 4.0g (5.8mmol) 2, 7-screw [4-(trimethylsilyl) (ethynyl) phenyl]-9, and 9'-G n-hexyl fluorene and 6ml of 20wt(s)% potassium fluorides and making it dissolve in a 100ml methanol, it was made to react in ordinary temperature for 6 hours. After a reaction is completed, and adding a 50ml methanol, making it a vacuum and removing a solvent, The ether extracts 3 times, rinse several times, and it is made to dry with a magnesium sulfate anhydride. After making the solvent into the vacuum and removing it, after filtering, and the mixed solvent of a hexane/methylene chloride (4:1) refining using the silica gel column, removed the solvent, it was made to recrystallize by the hexane, and the solid-state with a light yellow of 2.8g (90% of yield) was obtained. The melting point was 101-102 degrees C.

1 H-NMR (CDCl₃), delta 0.78-1.42 (m, 22H, CH₂, CH₃), 2.02-2.1 (m, 4H, CCH₂), 3.19 (s, 2H, CH), 7.42-7.78 (m, 14H, aromatic series) [0085] Example 192, the 7-screw (4-aldehyde phenyloxy phenyl) -9, the synthetic agitator of a 9'-G n-hexyl fluorene (M-19), In the three-lot flask of 100ml ** equipped with the thermometer and the reflux capacitor The bottom of an argon ambient atmosphere, 4.0g (7.7mmol) 2 and the 7-screw (4-hydroxyphenyl) -9, a 9'-G n-hexyl fluorene, After putting in 1.96g (15.8mmol) 4-fluoro benzaldehyde and 2.13g (15.4mmol) potassium carbonate and making it dissolve in 25ml dimethylacetamide (DMAc), it was made to flow back at 120 degrees C for 8 hours. When reduced temperature in ordinary temperature and said solution was made gradually dropped at 400ml

water, after the reaction was completed, and the solid-state deposited, after having filtered, dissolving said solid-state in diethylether further and washing in cold water several times, made it dry with a magnesium sulfate anhydride, filtered, removed the solvent, it was made to recrystallize with the mixed solvent of ethyl acetate/hexane, and the white solid-state was obtained. Subsequently, the obtained solid-state was fully dried in 40-degree C vacuum oven, and the 4.3g (76.7% of yield) product was obtained. The melting point was 86-88 degrees C.

1 H-NMR (CDCl₃), delta 0.73-1.09 (m, 22H, CH₂ and CH₃), 2.03-2.10 (m, 4H, CCH₂), 7.13-7.91 (m, 22H, aromatic series), 9.95 (s, 2H, CHO) [0086] Example 202, the 7-screw (4-nitrophenyloxy phenyl) -9, the synthetic agitator of a 9'-G n-hexyl fluorene (M-20), In the three-lot flask of 100ml ** equipped with the thermometer and the reflux capacitor The bottom of an argon ambient atmosphere, 6.0g (11.6mmol) 2 and the 7-screw (4-hydroxyphenyl) -9, a 9'-G n-hexyl fluorene, After putting in a 3.3g (23.7mmol) 1-fluoro-4-nitrobenzene and 3.2g (23.1mmol) potassium carbonate and making it dissolve in 35ml dimethylacetamide, it was made to flow back at 120 degrees C for 8 hours. When reduced temperature in ordinary temperature and said solution was made gradually dropped at 400ml water, after the reaction was completed, and the solid-state deposited, after having filtered, dissolving said solid-state in diethylether further and washing in cold water several times, made it dry with a magnesium sulfate anhydride, filtered, removed the solvent, it was made to recrystallize with the mixed solvent of ethyl acetate/hexane, and the solid-state of light yellow was obtained. Subsequently, the obtained solid-state was fully dried in 40-degree C vacuum oven, and the 7.2g (79.8% of yield) product was obtained. The melting point was 102-103 degrees C.

1 H-NMR (CDCl₃), delta 0.73-1.09 (m, 22H, CH₂ and CH₃), 2.03-2.11 (m, 4H, CCH₂), 7.06-8.28 (m, 22H, aromatic series) [0087] In the two-lot flask of 500ml ** equipped with Example 212, the 7-screw (4-aminophenyl oxy-phenyl) -9, and the synthetic agitator of a 9'-G n-hexyl fluorene (M-21) After putting in 6.0g (7.9mmol) 2 and the 7-screw (4-nitrophenyloxy phenyl) -9, a 9'-G n-hexyl fluorene, and 10wt(s)% activated carbon support palladium (Pd/C) 2g and making it dissolve in 200ml THF, It was made to react in ordinary temperature for 24 hours, making it filled up with hydrogen gas. After the reaction was completed, made it dry with a magnesium sulfate anhydride, filtered, the liquid with the viscosity which removed and obtained the solvent was made to recrystallize with the mixed solvent of ethyl acetate/hexane, and the yellow crystal was obtained. Subsequently, the obtained crystal was fully dried in 40-degree C vacuum oven, and the 4.7g (85% of yield) product was obtained. The melting point was 57-58 degrees C.

1 H-NMR (CDCl₃), delta 0.71-1.05 (m, 22H, CH₂ and CH₃), 2.01-2.05 (m, 4H, CCH₂), 6.68-7.75 (m, 22H, aromatic series) [0088] Example 222, the 7-screw (3-carboxyl phenyl) -9, the synthetic agitator of a 9'-G n-hexyl fluorene (M-22), In the three-lot flask of 500ml ** equipped with the thermometer and the reflux capacitor Put in 15.0g (23.8mmol) 2 and the 7-screw (3-ethyloxy carbonyl phenyl) -9, and a 9'-G n-hexyl fluorene, and it is made to dissolve in 100ml THF under an argon ambient atmosphere. Furthermore, 100ml of lithium-hydroxide (LiOH) water solutions of 1M was added, and it was made to flow back for 5 hours. After the reaction was completed, THF was removed, and it agitated, adding concentrated hydrochloric acid gradually, and the solid-state was obtained. Subsequently, after filtering said solid-state and washing in cold water thoroughly, put in the hexane further, it was made to agitate for 2 hours, and the cream-colored solid-state was obtained. Subsequently, the obtained solid-state was fully dried in 40-degree C vacuum oven, and the 13.1g (95% of yield) product was obtained. The melting point was 227-229 degrees C.

1 H-NMR (DMSO-d₆), delta 0.58-0.92 (m, 22H, CH₂ and CH₃), 2.05-2.09 (m, 4H, CCH₂), 7.5-8.28 (m, 14H, aromatic series) [0089] Example 232, the 7-screw (3-chloro carbonyl phenyl) -9, the synthetic agitator of a 9'-G n-hexyl fluorene (M-23), In the three-lot flask of 50ml ** equipped with the thermometer and the reflux capacitor After putting in, heating and dissolving 8.0g (13.9mmol) 2 and the 7-screw (3-carboxyl phenyl) -9, a 9'-G n-hexyl fluorene, and a 40ml thionyl chloride, 2ml DMF was added and it was made to flow back under an argon ambient atmosphere for 24 hours. After the reaction was completed, and reducing the temperature of said solution in ordinary temperature, the solvent was completely removed under reduced pressure and what adds a cyclohexane and is dissolved, and the thing which is not dissolved were separated. Subsequently, after removing a solvent to said thing dissolved, made it dissolve in a hexane further, it was made to recrystallize, and the yellow crystal was obtained. Subsequently, filtered said crystal, it was made to fully dry in 40-degree C vacuum oven, and the 6.0g (70% of yield) product was obtained. The melting point was 113-114 degrees C.

1 H-NMR (CDCl₃), delta 0.72-1.13 (m, 22H, CH₂ and CH₃), 2.04-2.11 (m, 4H, CCH₂), 7.26-8.41 (m, 14H, aromatic series) [0090] the three-lot flask of 250ml ** equipped with Example 242, the 7-screw (4-hydroxy methylphenyl) -9, the synthetic dropping wax of a 9'-G n-hexyl fluorene (M-24), and an agitator and a reflux capacitor — the bottom of an argon ambient atmosphere, 6.0g (9.5mmol) 2 and the 7-screw (4-ethyloxy carbonyl phenyl) -9, and a 9'-G n-hexyl fluorene — putting in — anhydrous [30ml] — it was made to dissolve in THF moreover, anhydrous [40ml] — after having prepared the ice bath after having made said reactant add quickly using a dropping wax after manufacturing LiAlH₄ solution of 1M to THF, and making this mixture flow back for 24 hours, and making water dropped gradually — further — 16wt(s)% NaOH was dropped. Subsequently, after it filters precipitate and chloroform washes, chloroform and water extract a solution. Subsequently, after making it dry with a magnesium sulfate anhydride, filtering and decompressing the extracted organic solution and chloroform's removing, it was made to recrystallize with the mixed solvent of ethyl acetate/hexane, and the white solid-state was obtained. Subsequently, filtered said solid-state, it was made to fully dry in 40-degree C vacuum oven, and the 5.1g (96% of yield) product was obtained. The melting point was 113-114 degrees C.

1 H-NMR (CDCl₃), delta 0.73-1.07 (m, 22H, CH₂ and CH₃), 1.89 (s, 2H, OH), 2.01-2.09 (m, 4H, CCH₂), 4.78 (s, 4H, CH₂), 7.47-7.80 (m, 14H, aromatic series) [0091] Example 252, the 7-screw (4-chloro methylphenyl) -9, the

synthetic agitator of a 9'-G n-hexyl fluorene (M-25), In the three-lot flask of 100ml ** equipped with the thermometer and the reflux capacitor After putting in 4.0g (7.31mmol) 2 and the 7-screw (4-hydroxy methylphenyl) -9, and the 9'-G n-hexyl fluorene and making it dissolve in a 50ml methylene chloride under an argon ambient atmosphere, After making the solution which added the 1.4ml thionyl chloride and the 0.05ml pyridine flow back for 12 hours and reducing temperature in ordinary temperature, said methylene chloride, the thionyl chloride, and the pyridine were removed under reduced pressure. Subsequently, after the mixed solvent of a hexane/ethyl acetate (5:1) refined the remaining solid-state using the silica gel column, it was made to recrystallize with the mixed solvent of chloroform/methanol, and the white crystal was obtained. Subsequently, filtered said crystal, it was made to fully dry in 40-degree C vacuum oven, and the 4.1g (94% of yield) product was obtained. The melting point was 104-105 degrees C.

1 H-NMR (CDCl₃), delta 0.73-1.13 (m, 22H, CH₂ and CH₃) and 2.00- 2.08 (m, 4H, CH₂), 4.68 (s, 4H, CH₂Cl), and 7.49-7.81 (m, 14H, aromatic series) [0092] Example 262, the 7-screw (4-hydrazide phenyl) -9, the synthetic agitator of a 9'-G n-hexyl fluorene (M-26), In the three-lot flask of 100ml ** equipped with the thermometer and the reflux capacitor Under the argon ambient atmosphere, after adding, heating and dissolving 5.0g (7.92mmol) 2 and the 7-screw (3-ethyloxy carbonyl phenyl) -9, a 9'-G n-hexyl fluorene, and 35ml butyl alcohol, a hydrazine and 1 6ml hydrate was dropped. Subsequently, after making it react at 80 degrees C for 48 hours, temperature was reduced in ordinary temperature and ethyl acetate and water extracted it. Subsequently, after drying an organic layer with a magnesium sulfate anhydride, only little ethyl acetate was left and removed. Subsequently, after dropping said little ethyl acetate at the hexane and settling it, washed for 1 hour, filtered the solid-state, it was made to fully dry in 40-degree C vacuum oven, and the 2.0g (42% of yield) product was obtained. The melting point was 134-136 degrees C. 1 H-NMR (CDCl₃), delta 0.72-1.19 (m, 22H, CH₂ and CH₃) and 2.03- 2.10 (m, 4H, CH₂), 4.21 (br, s, 4H, NH₂), 7.51 (s, 2H, NH), and 7.60-7.90 (m, 14H, aromatic series) [0093] Example 272, the 7-screw (3-hydrazide phenyl) -9, the synthetic agitator of a 9'-G n-hexyl fluorene (M-27), In the three-lot flask of 100ml ** equipped with the thermometer and the reflux capacitor Under the argon ambient atmosphere, after adding, heating and dissolving 5.0g (7.92mmol) 2 and the 7-screw (3-ethyloxy carbonyl phenyl) -9, a 9'-G n-hexyl fluorene, and 35ml butyl alcohol, a hydrazine and 1 6ml hydrate was dropped. Subsequently, after making it react at 80 degrees C for 48 hours, temperature was reduced in ordinary temperature and ethyl acetate and water extracted it. Subsequently, after drying the extracted organic layer with a magnesium sulfate anhydride, only little ethyl acetate was left and removed. Subsequently, after dropping said little ethyl acetate at the hexane and settling it, washed for 1 hour, filtered the solid-state, it was made to fully dry in 40-degree C vacuum oven, and the 2.5g (52.4% of yield) product was obtained. The melting point was 106-108 degrees C.

1 H-NMR (CDCl₃), delta 0.72-1.06 (m, 22H, CH₂ and CH₃) and 2.03- 2.10 (m, 4H, CH₂), 4.21 (br, s, 4H, NH₂), 8.09 (s, 2H, NH), and 7.60-7.90 (m, 14H, aromatic series) [0094] To the round bottom flask equipped with the synthetic agitator and capacitor of Example 282, the 7-screw (4-methoxyphenyl) -9, and a 9'-G n-hexyl fluorene (M-28) The bottom of an argon ambient atmosphere, a 45.1g (81.4mmol) 2, 7-(dibromo)-9, and 9'-G n-hexyl fluorene, Put in 32.0g (0.21 mols) p-methoxyphenyl borate and 1.06g (1mmol) tetrakis triphenyl HOSUFINIUMU palladium (O), and it is made to dissolve in 600ml toluene. Furthermore, the potassium carbonate water solution (2M and 400ml) was added, and it was made to flow back at the temperature of 120 degrees C for 48 hours. After collected only organic layers, having washed in cold water several times, after toluene extracted the reactant several times, the magnesium sulfate anhydride's having removed moisture, filtering, removing a solvent and refining using a column using ethyl acetate as an expansion solvent, it was made to recrystallize as a solvent using ethyl acetate/hexane, and the 41.5g (83% of yield) product was obtained. The melting point was 104-105 degrees C.

1 H-NMR (CDCl₃), delta 0.76-1.16 (m, 22H, CH₂, CH₃), 2.10- (m, 4H, CCH₂), 3.91 (s, 6H, OCH₃), 7.03-7.75 (m, 14H, aromatic series) [0095] To Example 292, the 7-screw (4-hydroxyphenyl) -9, and the synthetic round bottom flask of a 9'-G n-hexyl fluorene (M-29) After putting in 30.0g (54.9mmol) 2 and the 7-screw (4-methoxyphenyl) -9, and the 9'-G n-hexyl fluorene and making it dissolve in a 400ml methylene chloride, - It is made to react at said temperature for 1 hour, and it was made to react for 24 hours, after being gradually dropped with the reaction temperature of 70 degrees C, boric-acid covering [1M and 220ml] it in 1 hour, raising temperature in ordinary temperature. Subsequently, the organic layer was made to separate after hydrolyzing by adding water to said reactant. Subsequently, if a 2-N sodium-hydroxide water solution is added in said organic layer and the solid-state of an alkali condition deposits The ether extracts and only organic layers are collected, after adding a thin hydrochloric acid, making it neutralize and dissolving in transparency. Distilled water washes several times and a magnesium sulfate anhydride is made to remove moisture. After removing a solvent and ethyl acetate/hexane (1:10) refined, using a column as an expansion solvent, it was made to recrystallize as a solvent using the ether, and the 21.8g (76.6% of yield) product was obtained. The measured melting point was 142-143 degrees C.

1 H-NMR (DMSO-d₆), delta 0.61-1.16 (m, 22H, and -CH₂-, -CH₃), 2.10-2.12 (m, 4H, and -CCH₂-), 6.89-7.85 (m, 14H, aromatic series), 9.57 (s, 2H, -OH) [0096] To Example 302, the 7-screw (4-SHIANATO phenyl) -9, and the synthetic round bottom flask of a 9'-G n-hexyl fluorene (M-30) 10.0g (19.3mmol) 2 and the 7-screw (4-hydroxyphenyl) -9, a 9'-G n-hexyl fluorene, and 6.1g (57.9mmol) cyano bromide are added under an argon ambient atmosphere. Make a 100ml acetone agitate and it was made to dissolve, and after making it dropped in 30 minutes at the temperature of -30 degrees C, having applied 8ml triethylamine, the reaction was performed for 10 hours, raising temperature in ordinary temperature. Subsequently, after having made it dry with a magnesium sulfate anhydride, having filtered, after making the methylene chloride extract and collecting organic layers, after adding 500ml water to said reactant and interrupting a reaction (quanching), and distilled water's washing several times, and removing a

solvent, it was made to recrystallize with ethyl acetate and the 8.7g (79.4% of yield) product was obtained. The melting point was 125–126 degrees C.

1 H-NMR (CDCl₃), delta 0.74–1.08 (m, 22H, and –CH₂–, –CH₃–), 2.03–2.07 (m, 4H, and –CCH₂–), 7.40–7.84 (m, 14H, aromatic series) [0097] To the round bottom flask equipped with the synthetic Dean Stark (Dean Stark) equipment of an Example 312, 7-screw [4-(3, 4-dicyano phenoxy) phenyl]–9, and 9'-G n-hexyl fluorene (M-31) 10.0g (19.3mmol) 2 and the 7-screw (4-hydroxyphenyl) –9, and a 9'-G n-hexyl fluorene are put in. It was made to flow back, after making it dissolve in 50ml DMF and 40ml toluene, adding 5.6 moreg (40.5mmol) potassium carbonate, and maintaining the temperature of about 140 degrees C. Subsequently, after removing water and toluene from said Dean Stark completely, about 60 degrees C is made to cool temperature, it added to the reaction mixture and 6.93g (40.5mmol) p-nitro phthalonitrile was made to react to it for 24 hours. Subsequently, after settling said reactant in 1000ml water, filtered sediment, carried out reduced pressure drying at 60 degrees C, a hexane/ethyl acetate (4:1) refined, using a column as an expansion solvent, it was made to recrystallize with ethyl acetate, and the 10.2g (69% of yield) product was obtained. The melting point was 183–184 degrees C.

1 H-NMR (CDCl₃), delta 0.68–0.81 (m, 22H, and –CH₂–, –CH₃), 2.06–2.08 (m, 4H, and –CCH₂–), 7.14–7.80 (m, 20H, aromatic series) [0098] To the synthetic round bottom flask of an Example 322, 7-screw [4-(3, 4-dicarboxy phenoxy) phenyl]–9, and 9'-G n-hexyl fluorene (M-32) A 10.0g (13mmol) 2, 7-screw [4-(3, 4-dicyano phenoxy)–phenyl]–9, and 9'-G n-hexyl fluorene, It was made to flow back for three days, putting in and agitating a 14.6g (0.26mmol) potassium hydroxide, 75ml distilled water, and 75ml ethanol. Subsequently, after removing the impurity which is not dissolved by filtering a hot reactant, the hydrochloric acid was added, after filtering the solid-state which adjusted pH to 2–3 and was obtained and washing in cold water several times, neutralize, carried out reduced pressure drying at 60 degrees C for 24 hours, it was made to recrystallize by ethyl acetate and n-hexane, and the product with a white of 8.6g (78.3% of yield) was obtained. The melting point was 214–215 degrees C.

1 H-NMR (DMSO-d₆), delta 0.58–1.20 (m, 22H, CH₂, CH₃), 2.16–2.20 (m, 4H, CCH₂), 7.16–7.92 (m, 20H, aromatic series) [0099] The 5.0g (5.9mmol) 2, 7-screw [4-(3, 4-dicarboxy phenoxy) phenyl]–9, and 9'-G n-hexyl fluorene and the 50ml acetic anhydride were put into the synthetic round bottom flask of an Example 332, 7-screw [4-(3, 4-dicarboxy phenoxy) phenyl]–9, and 9'-G n-hexyl full orange anhydride (M-33), and it was made to flow back for 24 hours. After removing the impurity which is not dissolved by filtering a hot solution, it was made to cool gradually and the 3.75g (78% of yield) product was obtained. The measured melting point was 187–188 degrees C.

1 H-NMR (CDCl₃), delta 0.76–1.12 (m, 22H, CH₂, CH₃), 2.13–2.15 (m, 4H, CCH₂), 7.24–8.04 (m, 20H, aromatic series) [0100] To the 1l. round bottom flask equipped with the synthetic capacitor and dropping wax of Example 342, the 7-screw (4-acetyl phenyl) –9, and a 9'-G n-hexyl fluorene (M-34) 30.0g (61.6mmol) 2 and the 7-screw (diphenyl) –9, a 9'-G n-hexyl fluorene, and 500ml carbon disulfide are put in. After agitating in ordinary temperature and making it dissolve completely, 24.66g (185mmol) 3 aluminum chlorides are added at 0 degree C, and after making it dropped in 1 hour using a dropping wax, applying a 14.5g (185mmol) acetyl chloride, it was made to flow back for 24 hours. Subsequently, after filling the mixture of the hydrochloric acid of 2M, and iced water with said reactant and interrupting a reaction, After making a methylene chloride extract, collecting organic layers and washing in cold water several times, a magnesium sulfate anhydride is made to remove moisture. After filtering, removing a solvent and the methylene chloride/hexane (1/10) refined, using a column as an expansion solvent, it was made to recrystallize by the methylene chloride/hexane, and the 23.5g (66.8% of yield) product was obtained. The measured melting point was 130–131 degrees C.

1 H-NMR (CDCl₃), delta 0.73–0.79 (m, 22H, CH₂, CH₃), 2.07 (m, 4H, CCH₂), 2.68 (s, 6H, COCH₃), 7.63–8.12 (m, 14H, aromatic series) [0101] After putting 10.0g (15.5mmol) 2 and the 7-screw (4-BUOMO phenyl) –9, the 9'-G n-hexyl fluorene, and the 4.2g (46.5mmol) copper cyanide into the round bottom flask equipped with Example 352, the 7-screw (4-cyanophenyl) –9, and the synthetic capacitor of a 9'-G n-hexyl fluorene (M-35) and dissolving 60ml DMF in it, reflux was performed for 48 hours, agitating. Subsequently, after filling 1l. of 15% of aqueous ammonia solutions with the reactant and making precipitate generate, Filter, and after it collects precipitate and 15% of aqueous ammonia solution, 10% of aqueous ammonia solution, and distilled water fully wash, carry out reduced pressure drying at 60 degrees C, make moisture remove completely, make it dissolve in a hot acetone, and it filters. After removing the impurity which is not dissolved and ethyl acetate/hexane (1:1) refined, using a column as an expansion solvent, it was made to recrystallize using ethyl acetate/hexane, and the 6.6g (79.4% of yield) product was obtained. The measured melting point was 113–115 degrees C.

1 H-NMR (CDCl₃), delta 0.71–1.58 (m, 22H, CH₂, CH₃), 2.01–2.08 (m, 4H, CCH₂), 7.56–7.85 (m, 14H, aromatic series) [0102] Example 362, the 7-screw (p-hydroxy styryl) –9, the synthetic agitator of a 9'-G n-hexyl fluorene (M-36), In the three-lot flask of 500ml ** equipped with the thermometer and the reflux capacitor After putting in 32.7g (0.05 mols) 2 and the 7-screw (p-acetoxy styryl) –9, a 9'-G n-hexyl fluorene, and 28.0g (0.5 mols) KOH and making it dissolve in a 200ml methanol, it was made to flow back under nitrogen-gas-atmosphere mind for 12 hours.

Subsequently, reaction temperature was reduced in ordinary temperature, said reaction mixture was gradually dropped at 2.0l. 2.0-N hydrochloric-acid water solution, and the solid-state was deposited. Subsequently, after filtering and washing said solid-state which deposited in cold water and adding toluene further, it distilled and water and toluene were removed. Subsequently, the generated solid-state was made to recrystallize twice by toluene, and 27.1g (95% of yield) of solid-states of pure yellow was obtained. The melting point was 96–97 degrees C.

1 H-NMR (CDCl₃), delta 0.56–1.15 (m, 22H, CH₂ and CH₃), 2.00 (br, 4H, CH₂), 5.10 (br, s, 2H, OH), 6.82–6.86 (d, 4H, vinyl), 7.08–7.64 (m, 14H, aromatic series) [0103] The synthetic agitator of an Example 372, 7-screw [4-(3, 4-dicarboxy phenoxy) phenylene vinyl]–9, and 9'-G n-hexyl full orange anhydride (M-37), In the three-lot flask of

250ml ** equipped with the thermometer and the reflux capacitor The 3.0g (3.3mmol) 2, 7-screw [4-(3, 4-dicarboxy phenoxy) phenylene vinyl]-9, and 9'-G n-hexyl fluorene, the 15ml acetic anhydride, and the 15ml acetic acid were put in, and it was made to flow back for 24 hours. Subsequently, after removing the impurity which is not dissolved by filtering hot reaction mixture, it was made to cool gradually and the 1.9g (67% of yield) solid-state was obtained. The melting point was 190-193 degrees C.

1 H-NMR (CDCl₃), delta 0.71-1.25 (m, 22H, CH₂ and CH₃), 2.00 (br, 4H, CH₂), 6.82-6.86 (d, 4H, vinyl), 7.09-7.65 (m, 20H, aromatic series) [0104] Example 382, the 7-screw (4-fluoro styryl)-9, the synthetic agitator of a 9'-G n-hexyl fluorene (M-38), In the three-lot flask of 250ml ** equipped with the thermometer and the reflux capacitor The bottom of an argon ambient atmosphere, 17.7g (36mmol) 2 and 7-dibromo -9, a 9'-G n-hexyl fluorene, and 10g (82mmol) 4-fluoro styrene, After putting in 0.113g palladium (II) acetate, a 1.13g tree o-tolyl phosphine, and 17ml tree n butylamine, 60ml DMF was added and it was made to react at 100 degrees C for 24 hours. Subsequently, after having reduced the temperature of said reactant in ordinary temperature, and diethylether and water having extracted and drying an organic layer with a magnesium sulfate anhydride, removed completely under reduced pressure of diethylether, it was made to recrystallize with the mixed solvent of a hexane/ethyl acetate, and the yellow solid-state was obtained. Subsequently, filtered said solid-state, it was made to fully dry in 40-degree C vacuum oven, and the 1.1g (53% of yield) product was obtained. The melting point was 110-111 degrees C.

1 H-NMR (CDCl₃), delta 0.66-1.15 (m, 22H, CH₂ and CH₃), 1.95-2.00 (m, 4H, CH₂), 7.08-7.65 (m, 14H, aromatic series, 4H, vinyl) [0105] Example 392, the 7-screw (3-nitro styryl)-9, the synthetic agitator of a 9'-G n-hexyl fluorene (M-39), In the three-lot flask of 250ml ** equipped with the thermometer and the reflux capacitor The bottom of an argon ambient atmosphere, 33.0g (67mmol) 2 and 7-dibromo -9, a 9'-G n-hexyl fluorene, and 25g (168mmol) 3-nitro styrene, After putting in 0.151g palladium (II) acetate, a 1.232g tree o-tolyl phosphine, and 15.2g triethylamine, 100ml DMF was added and it was made to react at 100 degrees C for 24 hours. Subsequently, after reduced the temperature of said reactant in ordinary temperature, said reactant was dropped at 1l. of methanols containing a small amount of hydrochloric acid, depositing the solid-state, filtering this solid-state and a methanol's washing, it was made to fully dry in 40-degree C vacuum oven, and the 31.5g (75% of yield) product was obtained. The melting point was 189-192 degrees C.

1 H-NMR (CDCl₃), delta 0.66-1.15 (m, 22H, CH₂ and CH₃), 1.95-2.00 (m, 4H, CH₂), 7.15-8.48 (m, 14H, aromatic series, 4H, vinyl) [0106] Example 402, the 7-screw (4-nitro styryl)-9, the synthetic agitator of a 9'-G n-hexyl fluorene (M-40), In the three-lot flask of 250ml ** equipped with the thermometer and the reflux capacitor The bottom of an argon ambient atmosphere, 33.0g (67mmol) 2 and 7-dibromo -9, a 9'-G n-hexyl fluorene, and 25g (168mmol) 4-nitro styrene, After putting in 0.151g palladium (II) acetate, a 1.232g tree o-tolyl phosphine, and 15.2g triethylamine, 100ml DMF was added and it was made to react at 100 degrees C for 24 hours. Subsequently, after reduced the temperature of said reactant in ordinary temperature, said reactant was dropped at 1l. of methanols containing a small amount of hydrochloric acid, depositing the solid-state, filtering this solid-state and a methanol's washing, it was made to fully dry in 40-degree C vacuum oven, and the 33g (78% of yield) product was obtained. The melting point was 164-166 degrees C.

1 H-NMR (CDCl₃), delta 0.66-1.15 (m, 22H, CH₂ and CH₃), 1.95-2.00 (m, 4H, CH₂), 7.15-7.81 (m, 14H, aromatic series, 4H, vinyl) [0107] The polymerization of the synthetic example 412 of a polymer, the 7-screw (4-aminophenyl)-9, a 9'-G n-hexyl fluorene (M-3), and an isophthal aldehyde (P-1, P-1-1, and P-1-2)

In 50ml flask equipped with the agitator under nitrogen-gas-atmosphere mind, 0.516g (1mmol) 2 and the 7-screw (4-aminophenyl)-9, a 9'-G n-hexyl fluorene, A 0.134g (1mmol) isophthal aldehyde, p-toluene sulfide and 1 3.0mg (0.016mmol) hydrate, and a 0.224g calcium chloride are put in. 3ml hexa methyl phosphoamides (HMPA) and 3ml dimethyl sulfoxide (DMSO) were added, and it was made to dissolve. Subsequently, after making said mixed solvent react in ordinary temperature for 24 hours, it was gradually dropped at the 1l. methanol, and the polymer was deposited. Subsequently, after filtering the polymer which deposited and making it dissolve in chloroform further, the polymer which the methanol was made to reprecipitate and was refined was obtained. Subsequently, after it filtered said obtained polymer and the methanol washed thoroughly, it was made to fully dry in 40-degree C vacuum oven, and the polymer with a yellow of 0.57g (92.8% of yield) was obtained.

1 H-NMR (CDCl₃), delta 0.76-1.1 (CH₂ and CH₃), 2.08 (br, s, CCH₂), 7.39-8.52 (m, aromatic series), 8.68 (s, ArCH=NAr).

[0108] After dissolving P-1 polymer in which photo luminescence is not shown in chloroform, when one drop of concentrated hydrochloric acid of an inorganic acid was added, the polymer (P-1-1) with which the acid was added was formed, and, as for this polymer, photo luminescence was shown. After dissolving P-1 polymer in chloroform by the same approach, when little dropping of the p-toluene sulfide of an organic acid was carried out, the polymer (P-1-2) with which the acid was added was formed, and this polymer also showed photo luminescence.

[0109] The polymerization of Example 422, the 7-screw (4-aminophenyl)-9, a 9'-G n-hexyl fluorene (M-3), and a 2, the 7-screw (4-aldehyde phenyl)-9 and a 9'-G n-hexyl fluorene (M-6) (P-2)

In 50ml flask equipped with the agitator under nitrogen-gas-atmosphere mind, 0.516g (1mmol) 2 and the 7-screw (4-aminophenyl)-9, a 9'-G n-hexyl fluorene, 0.542g (1mmol) 2 and the 7-screw (4-aldehyde phenyl)-9, a 9'-G n-hexyl fluorene, p-toluene sulfide and 1 0.003g (0.016mmol) hydrate and a 0.336g calcium chloride are put in, and 3ml HMPA and 3ml DMSO were added, and it was made to dissolve. Subsequently, after making said mixed solvent react in ordinary temperature for 24 hours, it was gradually dropped at the 1l. methanol, and the polymer was deposited. Subsequently, after filtering the polymer which deposited and making it dissolve in chloroform further, the polymer which the methanol was made to reprecipitate and was refined was obtained. Subsequently, after it filtered said

obtained polymer and the methanol washed thoroughly, it was made to fully dry in 40-degree C vacuum oven, and the polymer with a yellow of 0.87g (85.3% of yield) was obtained.

¹H-NMR (CDC13), delta 0.79-1.1 (CH₂ and CH₃), 2.11 (br, s, CCH₂), 7.43-8.09 (m, aromatic series), 8.64 (s, ArCH=NAr).

[0110] The polymerization of Example 432, the 7-screw (4-aminophenyl) -9, a 9'-G n-hexyl fluorene (M-3), and 3 and 6-G hexyloxy terephthal aldehyde (P-3)

3 and 6-G hexyloxy 0.258g (0.5mmol) 2 and 7-screw (4-aminophenyl) -9, 9'-G n-hexyl fluorene, and 0.167g (0.5mmol) terephthal aldehyde and a 0.0176g calcium chloride are put in, and 1.5ml HMPA and 1.5ml DMSO were added to 50ml flask equipped with the agitator, and it was made to dissolve in it under nitrogen-gas-atmosphere mind. Subsequently, after making said mixed solvent react in ordinary temperature for 24 hours, it was gradually dropped at the 1l. methanol, and the polymer was deposited. Subsequently, after filtering the polymer which deposited and making it dissolve in chloroform further, the polymer which the methanol was made to reprecipitate and was refined was obtained. Subsequently, after it filtered said obtained polymer and the methanol washed thoroughly, it was made to fully dry in 40-degree C vacuum oven, and the polymer with a yellow of 0.23g (57.5% of yield) was obtained.

¹H-NMR (CDC13), delta 0.74-1.85 (CH₂ and CH₃), 2.01 (br, s, CCH₂), 4.10 (t, -OCH₂), 7.43-7.80 (m, aromatic series), 9.02 (s, ArCH=NAr).

[0111] The polymerization of Example 442, the 7-screw (3-aminophenyl) -9, a 9'-G n-hexyl fluorene (M-5), and a 2, the 7-screw (4-aldehyde phenyl) -9 and a 9'-G n-hexyl fluorene (M-6) (P-4)

In 50ml flask equipped with the agitator under nitrogen-gas-atmosphere mind, 0.516g (1mmol) 2 and the 7-screw (3-aminophenyl) -9, a 9'-G n-hexyl fluorene, 0.542g (1mmol) 2 and the 7-screw (4-aldehyde phenyl) -9, a 9'-G n-hexyl fluorene, p-toluene sulfide and 1 0.003g (0.016mmol) hydrate and a 0.336g calcium chloride are put in, and 3ml HMPA and 3ml DMSO were added, and it was made to dissolve. Subsequently, after making said mixed solvent react in ordinary temperature for 24 hours, it was gradually dropped at the 1l. methanol, and the polymer was deposited. Subsequently, after filtering the polymer which deposited and making it dissolve in chloroform further, the polymer which the methanol was made to reprecipitate and was refined was obtained. Subsequently, after it filtered said obtained polymer and the methanol washed thoroughly, it was made to fully dry in 40-degree C vacuum oven, and the polymer with a yellow of 0.85g (83.3% of yield) was obtained.

¹H-NMR (CDC13), delta 0.74-1.1 (CH₂ and CH₃), 2.11 (br, s, CCH₂), 7.54-8.09 (m, aromatic series), 8.65 (s, ArCH=NAr).

[0112] The polymerization of Example 452, the 7-screw (3-aminophenyl) -9, a 9'-G n-hexyl fluorene (M-5), and an isophthal aldehyde (P-5)

0.516g (1mmol) 2 and the 7-screw (3-aminophenyl) -9, a 9'-G n-hexyl fluorene, a 0.134g (1mmol) isophthal aldehyde, p-toluene sulfide and 1 0.003g (0.016mmol) hydrate, and a 0.224g calcium chloride are put in, and 3ml HMPA and 3ml DMSO were added to 50ml flask equipped with the agitator, and it was made to dissolve in it under nitrogen-gas-atmosphere mind. Subsequently, after making said mixed solvent react in ordinary temperature for 24 hours, it was gradually dropped at the 1l. methanol, and the polymer was deposited. Subsequently, after filtering the polymer which deposited and making it dissolve in chloroform further, the polymer which the methanol was made to reprecipitate and was refined was obtained. Subsequently, after it filtered said obtained polymer and the methanol washed thoroughly, it was made to fully dry in 40-degree C vacuum oven, and the polymer with a white of 0.53g (86.3% of yield) was obtained.

¹H-NMR (CDC13), delta 0.76-1.1 (CH₂ and CH₃), 2.09 (br, s, CCH₂), 7.54-8.52 (m, aromatic series), 8.68 (s, ArCH=NAr).

[0113] The polymerization of Example 461, the 4-screw (3-aminophenyl) -3, 6-G hexyloxy benzene (M-16), and a 2, the 7-screw (4-aldehyde phenyl) -9 and a 9'-G n-hexyl fluorene (M-6) (P-6)

In 50ml flask equipped with the agitator under nitrogen-gas-atmosphere mind, 0.46g (1mmol) 1 and the 4-screw (3-aminophenyl) -3, 6-G hexyloxy benzene, 0.542g (1mmol) 2 and the 7-screw (4-aldehyde phenyl) -9, a 9'-G n-hexyl fluorene, p-toluene sulfide and 1 0.003g (0.016mmol) hydrate and a 0.224g calcium chloride are put in, and 3ml HMPA and 3ml DMSO were added, and it was made to dissolve. Subsequently, after making said mixed solvent react in ordinary temperature for 24 hours, it was gradually dropped at the 1l. methanol, and the polymer was deposited. Subsequently, after filtering the polymer which deposited and making it dissolve in chloroform further, the polymer which the methanol was made to reprecipitate and was refined was obtained. Subsequently, after it filtered said obtained polymer and the methanol washed thoroughly, it was made to fully dry in 40-degree C vacuum oven, and the polymer with a yellow of 0.64g (66.2% of yield) was obtained.

¹H-NMR (CDC13), delta 0.65-1.75 (CH₂ and CH₃), 2.09 (br, s, CCH₂), 4.10 (t, OCH₂), 6.68-8.02 (m, aromatic series), 8.58 (s, ArCH=NAr).

[0114] Under the polymerization (P-7) nitrogen-gas-atmosphere mind of Example 472, the 7-screw (4-carboxyl phenyl) -9, a 9'-G n-hexyl fluorene (M-11), and a 3 and 3'-dihydroxy-benzidine, In 100ml flask equipped with the agitator A 3 and 3'-dihydroxy (1.149g (2mmol) 2 and 7-screw (4-carboxyl phenyl) -9, 9'-G n-hexyl fluorene, and 0.432g (2mmol) benzidine (3 and 3'-dihydroxybenzidine) is put in. 10ml PPMA (a phosphorus pentaoxide/methansulfonic acid) and a 20ml tetramethylen sulfone were added, and it was made to dissolve.

Subsequently, the additional reaction was carried out for 3 hours, after making said mixed solution react at 140 degrees C for 1.5 hours and putting in 5ml PPMA further. Subsequently, temperature was reduced in ordinary temperature, the reactant was gradually dropped at 1l. water, and the polymer was deposited. Subsequently, after

the thin carbonic acid disodium solution washed the polymer which deposited, it washed it in cold water and the methanol finally washed thoroughly, it was made to fully dry in 40-degree C vacuum oven, and the 1.4g (98% of yield) black polymer was obtained. The obtained polymer was seldom dissolved in the common solvent.

[0115] The polymerization of Example 482, the 7-screw (4-chloro carbonyl phenyl) -9, a 9'-G n-hexyl fluorene (M-12), and terephthalic-acid dihydrazide (P-8 and p-9)

Under nitrogen-gas-atmosphere mind, 0.4g (0.65mmol) 2 and the 7-screw (4-chloro carbonyl phenyl) -9, a 9'-G n-hexyl fluorene, 0.126g (0.65mmol) terephthalic-acid dihydrazide, and a 0.1g lithium chloride (LiCl) were put into 50ml flask equipped with the agitator, and 11ml NMP was dissolved in it. Subsequently, after putting the 0.126g pyridine into said mixture and making it react at 80 degrees C for 4 hours, the temperature of said reactant was reduced in ordinary temperature, it was gradually dropped at the 1l. methanol, and the polymer was deposited. Subsequently, after it filtered the polymer which deposited and water and a methanol washed thoroughly, it was made to fully dry in 40-degree C vacuum oven, and the polymer (p-8) of 0.475g (99.7% of yield) cream was obtained.

1 H-NMR (DMSO-d6), delta 0.74-1.05 (CH2 and CH3), 2.16 (br, s, CCH2), 8.0-8.12 (br, aromatic series), 10.82 (s, CONH).

[0116] It was made to flow back, after heated and dissolving 0.2g (p-8) of said obtained polymers in POCl3, agitating for 4 hours. Subsequently, after it filtered the polymer after dropping said reactant at 1l. water gradually and depositing a polymer, and the methanol washed thoroughly, it was made to fully dry in 40-degree C vacuum oven, and the polymer (p-9) with a yellow of 0.15g was obtained. Solubility fell and the little dissolution of the obtained polymer was carried out at the common organic solvent.

[0117] The polymerization of Example 492, the 7-screw (4-chloro carbonyl phenyl) -9, a 9'-G n-hexyl fluorene (M-12), and isophthalic acid dihydrazide (P-10 and P-11)

Under nitrogen-gas-atmosphere mind, 0.8g (1.3mmol) 2 and the 7-screw (4-chloro carbonyl phenyl) -9, a 9'-G n-hexyl fluorene, 0.253g (1.3mmol) isophthalic acid dihydrazide, and a 0.15g lithium chloride were put into 50ml flask equipped with the agitator, and 18ml NMP was dissolved in it. Subsequently, after putting the 0.252g pyridine into said mixture and making it react at 80 degrees C for 4 hours, the temperature of said reactant was reduced in ordinary temperature, it was gradually dropped at the 1l. methanol, and the polymer was deposited. Subsequently, after it filtered the polymer which deposited and water and a methanol washed thoroughly, it was made to fully dry in 40-degree C vacuum oven, and the polymer (p-10) of 0.9g (94.7% of yield) cream was obtained.

1 H-NMR (DMSO-d6), delta 0.72-1.04 (CH2 and CH3), 2.16 (br, s, CCH2), 7.80-8.59 (m, aromatic series), 10.82 (s, CONH).

[0118] It was made to flow back, after put in, heated and dissolving POCl3 in 0.3g (p-10) of said obtained polymers, agitating for 4 hours. Subsequently, after it filtered the polymer after dropping said reactant at 1l. water gradually and depositing a polymer, and the methanol washed thoroughly, it was made to fully dry in 40-degree C vacuum oven, and the polymer (p-11) with a yellow of 0.23g was obtained. Solubility fell and the little dissolution of the obtained polymer was carried out at the common organic solvent.

[0119] The polymerization of Example 502, the 7-screw (3-chloro carbonyl phenyl) -9, a 9'-G n-hexyl fluorene (M-23), and terephthalic-acid dihydrazide (P-12 and P-13)

Under nitrogen-gas-atmosphere mind, 0.5g (0.8mmol) 2 and the 7-screw (4-chloro carbonyl phenyl) -9, a 9'-G n-hexyl fluorene, 0.158g (0.8mmol) terephthalic-acid dihydrazide, and a 0.1g lithium chloride were put into 50ml flask equipped with the agitator, and 11ml NMP was dissolved in it. Subsequently, after putting the 0.126g pyridine into said mixture and making it react at 80 degrees C for 5 hours, the temperature of said reactant was reduced in ordinary temperature, it was gradually dropped at the 1l. methanol, and the polymer was deposited. Subsequently, after it filtered the polymer which deposited and water and a methanol washed thoroughly, it was made to fully dry in 40-degree C vacuum oven, and the polymer (p-12) of 0.54g (92% of yield) cream was obtained.

1 H-NMR (DMSO-d6), delta 0.62-1.03 (CH2 and CH3), 2.16 (br, s, CCH2), 7.65-8.34 (m, aromatic series), 10.82 (s, CONH).

[0120] It was made to flow back, after heated [they put into them and] and dissolving 0.3g (p-12) of said obtained polymers in 10ml POCl3, agitating for 4 hours. Subsequently, after it filtered the polymer after dropping said reactant at 1l. water gradually and depositing a polymer, and the methanol washed thoroughly, it was made to fully dry in 40-degree C vacuum oven, and the polymer (p-13) of 0.28g cream was obtained. Solubility fell and the little dissolution of the obtained polymer was carried out at the common organic solvent.

[0121] The polymerization of Example 512, the 7-screw (3-chloro carbonyl phenyl) -9, a 9'-G n-hexyl fluorene (M-23), and isophthalic acid dihydrazide (P-14 and P-15)

Under nitrogen-gas-atmosphere mind, 1g (1.63mmol) 2 and the 7-screw (3-chloro carbonyl phenyl) -9, a 9'-G n-hexyl fluorene, 0.317g (1.63mmol) isophthalic acid dihydrazide, and a 0.1g lithium chloride were put into 50ml flask equipped with the agitator, and 7ml NMP was dissolved in it. Subsequently, after putting the 0.256g pyridine into said mixture and making it react at 80 degrees C for 4 hours, the temperature of said reactant was reduced in ordinary temperature, it was gradually dropped at the 1l. methanol, and the polymer was deposited. Subsequently, after it filtered the polymer which deposited and water and a methanol washed thoroughly, it was made to fully dry in 40-degree C vacuum oven, and the polymer (p-14) of 1.1g (92% of yield) cream was obtained.

1 H-NMR (DMSO-d6), delta 0.62-1.03 (CH2 and CH3), 2.16 (br, s, CCH2), 7.65-8.59 (m, aromatic series), 10.82 (s, CONH).

[0122] It was made to flow back, after put in, heated and dissolving 20ml POCl3 in 0.4g (p-14) of said obtained polymers, agitating for 24 hours. Subsequently, after it filtered the polymer after dropping said reactant at 1l. water

gradually and depositing a polymer, and the methanol washed thoroughly, it was made to fully dry in 40-degree C vacuum oven, and the polymer (p-15) of 0.38g cream was obtained. Solubility fell and the little dissolution of the obtained polymer was carried out at the common organic solvent.

[0123] The polymerization of Example 522, the 7-screw (4-hydroxyphenyl) -9, a 9'-G n-hexyl fluorene (M-29), and a 2, the 7-screw (4-chloro methylphenyl) -9 and a 9'-G n-hexyl fluorene (M-25) (P-16)

In the three-lot flask of 50ml ** equipped with the agitator and the reflux capacitor under nitrogen-gas-atmosphere mind 0.44g (0.85mmol) 2 and the 7-screw (4-hydroxyphenyl) -9, a 9'-G n-hexyl fluorene, 0.50g (0.85mmol) 2 and the 7-screw (4-chloro methylphenyl) -9, a 9'-G n-hexyl fluorene, and 0.04g (0.17mmol) benzyl triethyl ammoniumchloride are put in. After making it dissolve in 1.7ml DMSO and a 5.2ml toluene mixed solvent, 7ml of 50wt% NaOH water solutions was added. Subsequently, after reducing said reaction temperature in ordinary temperature after making it react at 100 degrees C for 7 hours, agitating said mixed solution strongly, and removing a water-solution layer, said reactant was gradually dropped at the 1l. methanol containing a small amount of hydrochloric acid, and the white polymer was deposited. Subsequently, after it filtered the polymer which deposited and the methanol washed thoroughly, it was made to dissolve in chloroform further and the polymer which the methanol was made to reprecipitate and was refined was obtained. Subsequently, after it filtered the obtained polymer and the methanol washed thoroughly, it was made to fully dry in 40-degree C vacuum oven, and the polymer with a white of 0.75g (85.2% of yield) was obtained.

1 H-NMR (CDC13), delta0.74-1.1 (CH2 and CH3), 2.01 (br, s, CCH2), 5.09 (s and OCH2C), 7.08-7.80 (m, aromatic series).

[0124] The polymerization of Example 532, the 7-screw (4-chloro methylphenyl) -9, a 9'-G n-hexyl fluorene (M-25), and 1, the 4-screw (4-hydroxy styryl) -3 and 6-G n-hexyloxy benzene (P-17)

In the three-lot flask of 50ml ** equipped with the agitator and the reflux capacitor under nitrogen-gas-atmosphere mind 0.44g (0.85mmol) 1 and the 4-screw (4-hydroxy styryl) -3, 6-G n-hexyloxy benzene, 0.50g (0.85mmol) 2 and the 7-screw (4-chloro methylphenyl) -9, a 9'-G n-hexyl fluorene, and 0.04g (0.17mmol) benzyl triethyl ammoniumchloride are put in. After making it dissolve in 1.7ml DMSO and a 5.2ml toluene mixed solvent, 7ml of 50wt% NaOH water solutions was added. Subsequently, after making it react at 100 degrees C for 7 hours, agitating said mixed solution strongly, reaction temperature was reduced in ordinary temperature, said reactant was gradually dropped at the 1l. methanol containing a small amount of hydrochloric acid, and the yellow polymer was deposited. Subsequently, after it filtered the polymer which deposited and the methanol washed thoroughly, it was made to dissolve in chloroform further and the polymer which the methanol was made to reprecipitate and was refined was obtained. Subsequently, after it filtered the obtained polymer and the methanol washed thoroughly, it was made to fully dry in 40-degree C vacuum oven, and the polymer with a yellow of 0.7g (79.7% of yield) was obtained.

1 H-NMR (CDC13), delta0.75-1.87 (CH2 and CH3), 2.00 (br, s, CCH2), 4.04 (s, OCH2), 5.09 (s and OCH2C), 7.03-7.72 (m, aromatic series).

[0125] The polymerization of Example 542, the 7-screw (4-acetyl phenyl) -9, a 9'-G n-hexyl fluorene (M-34), and the 4 and 4'-diamino -3 and 3'-dibenzoyl diphenyl ether (P-18 and P-18-1)

A 1.49g (14.7mmol) phosphorus pentaoxide and 5ml m-cresol are put into a round bottom flask under an argon ambient atmosphere at the temperature of 0 degree C. After making it react at 110 degrees C for 3 hours and generating a dehydrating agent, temperature is reduced in ordinary temperature. After putting 2, the 7-screw (4-acetyl phenyl) -9, and a 9'-G n-hexyl (4 and 4'-0.5g (12mmol) diamino -3, 3'-dibenzoyl diphenyl ether, and 0.69g (12mmol)) fluorene into a reactor, After having added 10ml m-cresol further, washing the wall surface of a flask and making a solution dilute, temperature was raised quickly and made to react to 110 degrees C for 11 hours. It filtered, after settling the solution after a reaction 3 times in 15% of triethylamine / ethanol solution (15/85), and after ethanol, water, and a methanol washed several times, reduced pressure drying was carried out at 40 degrees C, and the 0.98g (89% of yield) poly quinoline was obtained.

[0126] 1 H-NMR (CDC13), delta0.70-1.38ppm (m, 22H, CH2, CH3), 1.85 to 2.38 ppm (m, 4H, CCH2), 7.10 to 8.60 ppm (m, 32H, aromatic series).

After making 10-5 M concentration dissolve in chloroform P-18 polymer whose maximum PL wavelength was 431nm, 1 or the polymer (P-18-1) with which the acid was added when two drops were made dropped was formed in the concentrated hydrochloric acid of an inorganic acid, maximum PL wavelength changed to 554nm, and this polymer showed photo luminescence.

[0127] The polymerization of Example 552, the 7-screw (4-aminophenyl) -9, a 9'-G n-hexyl fluorene (M-3), and 6-FDA (P-19)

0.50g (0.97mmol) 2 and the 7-screw (4-aminophenyl) -9, and a 9'-G n-hexyl fluorene are put into a round bottom flask under ordinary temperature and nitrogen-gas-atmosphere mind. a 0.43g [after adding 3ml N-methyl pyrrolidone and making it dissolve] (0.97mmol) 4 and 4'-(hexafluoro isopropylidene) JIFUTARU acid anhydride (6-FDA) — putting in — 5ml N-methyl pyrrolidone — adding — 24 hours — the admiration reaction was carried out. Subsequently, having added the 0.47g (5.83mmol) pyridine and the 0.61g (5.83mmol) acetic anhydride, and maintaining the temperature of 40 degrees C, it was made to react for 6 hours and imide-ized. Subsequently, after filtering the precipitate which 1:1 mixed solutions of water and a methanol were made to reprecipitate, and was generated after reducing said solution in ordinary temperature, the methanol washed several times, reduced pressure drying was carried out at 60 degrees C, and polyimide with a thin yellow of 0.81g (90.2% of yield) was obtained.

1 H-NMR (CDC13), delta0.74-1.45ppm (m, 22H, CH2, CH3), 1.52 to 2.45 ppm (m, 4H, CCH2), 7.20 to 8.40 ppm (m,

20H, aromatic series).

[0128] The polymerization of Example 562, the 7-screw (4-hydroxyphenyl) -9, a 9'-G n-hexyl fluorene (M-29), and SEBAKOIRU chloride (P-20)

Put 1g (1.9mmol) 2 and the 7-screw (4-hydroxyphenyl) -9, a 9'-G n-hexyl fluorene, and 0.48g (1.9mmol) SEBAKOIRU chloride (sebacylchloride) into the round bottom flask equipped with the reflux capacitor under the argon ambient atmosphere, it was made to flow back for five days at 120 degrees C as a solvent using toluene, and solution polymerization was performed. Subsequently, it filtered, after making ordinary temperature cool said reaction solution and settling a methanol 3 times, and after water and a methanol washed several times, reduced pressure drying was carried out at 40 degrees C, and 1.3g (98% of yield) polyester was obtained.

1 H-NMR (CDC13), delta0.58-2.45ppm (m, 34H, CH2, CH3, CCH2), 2.50 to 2.90 ppm (m, 4H, COCH2), 7.05 to 8.10 ppm (m, 14H, aromatic series).

[0129] The polymerization of Example 572, the 7-screw (4-hydroxy styryl) -9, a 9'-G n-hexyl fluorene (M-36), and a deca fluoro biphenyl (P-21)

Under nitrogen-gas-atmosphere mind, in the two-lot flask of 100ml ** 1.36g (2.38mmol) 2 and the 7-screw (4-hydroxy styryl) -9, a 9'-G n-hexyl fluorene, 0.79g (2.38mmol) deca fluoro BAIFENIRU and 0.87g (6.30mmol) potassium carbonate are put in, after adding 20ml DMAc and making it dissolve, 120 degrees C was raised and the temperature of reaction mixture was made to react for 17 hours. Subsequently, after making ordinary temperature cool said reaction temperature, it was gradually dropped at 1l. water / methanol (1:1) solution, and the yellow polymer was deposited. Subsequently, after filtering the polymer which deposited and making it dissolve in chloroform, the polymer which the 1l. methanol was made to reprecipitate and was refined was obtained. Subsequently, after it filtered said obtained polymer and the methanol washed thoroughly, it was made to fully dry in 40-degree C vacuum oven, and the polymer with a thin yellow of 1.48g (72% of yield) was obtained.

1 H-NMR (CDC13), delta0.72-1.06 (CH2 and CH3), 2.00 (br, s, CCH2), 7.06-7.65 (m, vinyl, and aromatic series).

[0130] The polymerization of Example 582, the 7-screw (4-hydroxy styryl) -9, a 9'-G n-hexyl fluorene (M-36), and 4 and 4'-difluoro diphenylsulfone (P-22)

Under nitrogen-gas-atmosphere mind, in the two-lot flask of 100ml ** 1.36g (2.38mmol) 2 and the 7-screw (4-hydroxy styryl) -9, a 9'-G n-hexyl fluorene, 0.61g (2.38mmol) 4 and 4'-difluoro diphenylsulfone and 0.871g (6.30mmol) potassium carbonate are put in, after adding 20ml DMAc and making it dissolve, 120 degrees C was raised and reaction temperature was made to react for 17 hours. Subsequently, after making ordinary temperature cool said reaction temperature, it was gradually dropped at 1l. water / methanol (1:1) solution, and the cream-colored polymer was deposited. Subsequently, after filtering the polymer which deposited and making it dissolve in chloroform, the polymer which was made to reprecipitate with a 1l. methanol and was refined was obtained. Subsequently, after it filtered said obtained polymer and the methanol washed thoroughly, it was made to fully dry in 40-degree C vacuum oven, and the polymer of 1.3g (70% of yield) cream was obtained.

1 H-NMR (CDC13), delta0.72-1.06 (CH2 and CH3), 2.00 (br, s, CCH2), 7.04-7.92 (m, vinyl, and aromatic series).

[0131] The polymerization of Example 592, the 7-screw (4-hydroxy styryl) -9, and a 9'-G n-hexyl fluorene (M-36) and hexafluoro benzene (P-23)

1.23g (2.1mmol) 2 and the 7-screw (4-hydroxy styryl) -9, a 9'-G n-hexyl fluorene, 0.4g (2.1mmol) hexafluoro benzene, and 0.871g (6.30mmol) potassium carbonate are put in, after adding 20ml DMAc in the two-lot flask of 100ml ** and making it dissolve in it, 120 degrees C was raised in it and the temperature of reaction mixture was made to react to it under nitrogen-gas-atmosphere mind for 4 hours. Subsequently, after making ordinary temperature cool said reaction temperature, it was gradually dropped at 1l. water / methanol (1:1) solution, and the cream-colored polymer was deposited. Subsequently, after filtering the polymer which deposited and making it dissolve in chloroform, the polymer which was made to reprecipitate with a 1l. methanol and was refined was obtained. Subsequently, after it filtered said obtained polymer and the methanol washed thoroughly, it was made to fully dry in 40-degree C vacuum oven, and the polymer of 1.38g (89.6% of yield) cream was obtained.

1 H-NMR (CDC13), delta0.55-1.16 (CH2 and CH3), 2.00 (br, s, CCH2), 7.10-8.60 (m, vinyl, and aromatic series).

[0132] The polymerization of Example 602, the 7-screw (4-hydroxy styryl) -9, a 9'-G n-hexyl fluorene (M-36), and a 4 and 4'-difluoro benzophenone (P-24)

Under nitrogen-gas-atmosphere mind, in the two-lot flask of 100ml ** 1.36g (2.38mmol) 2 and the 7-screw (4-hydroxy styryl) -9, a 9'-G n-hexyl fluorene, A 0.52g (2.38mmol) 4 and 4'-difluoro benzophenone and 0.87g (6.30mmol) potassium carbonate are put in, after adding 20ml DMAc and making it dissolve, 120 degrees C was raised and reaction temperature was made to react for 17 hours. Subsequently, after making ordinary temperature cool said reaction temperature, it was gradually dropped at 1l. water / methanol (1:1) solution, and the yellow polymer was deposited. Subsequently, after filtering the polymer which deposited and making it dissolve in chloroform, the polymer which was made to reprecipitate with a 1l. methanol and was refined was obtained. Subsequently, after it filtered said obtained polymer and the methanol washed thoroughly, it was made to fully dry in 40-degree C vacuum oven, and the polymer with a yellow of 1.47g (82% of yield) was obtained.

1 H-NMR (CDC13), delta0.60-1.12 (CH2 and CH3), 2.00 (br, s, CCH2), 7.04-7.96 (m, vinyl, and aromatic series).

[0133] Example 612, the 7-screw (4-hydroxy styryl) -9, a 9'-G n-hexyl fluorene (M-36), and 2, 5-screw (4-fluoro phenyl) - Polymerization with 1, 3, and 4-OKISA diazole (P-25)

In the two-lot flask of 100ml ** equipped with the Dean Stark trap (Dean-Stark trap) under nitrogen-gas-atmosphere mind 1.36g (2.38mmol) 2 and the 7-screw (4-hydroxy styryl) -9, a 9'-G n-hexyl fluorene, 0.61g (2.38mmol) 2, 5-screw (4-fluoro phenyl) - 1, 3, and 4-OKISA diazole and 0.6g (4.34mmol) potassium carbonate are

put in. After adding the mixed solvent of 20ml NMP/CHP (1:1) and making it dissolve, raised reaction temperature at 150 degrees C, it was made to react for 6 hours, and the moisture in a reactor was removed completely.

Subsequently, after raising 180 more degrees C and making said reaction temperature react for 20 hours, ordinary temperature was made to cool, said reactant was diluted by NMP, it was gradually dropped at 1l. water / methanol (1:1) solution, and the yellow polymer was deposited. Subsequently, after filtering the polymer which deposited and making it dissolve in chloroform, the polymer which was made to reprecipitate with a 1l. methanol and was refined was obtained. Subsequently, after filtering said obtained polymer and washing thoroughly in order of an acetone, hot water, and a methanol, it was made to fully dry in 40-degree C vacuum oven, and the polymer with a yellow of 1.36g (72.4% of yield) was obtained.

1 H-NMR (CDC13), delta0.58-1.24 (CH2 and CH3), 2.00 (br, s, CCH2), 7.10-8.60 (m, vinyl, and aromatic series).

[0134] The polymerization of Example 622, the 7-screw (4-hydroxy styryl) -9, a 9'-G n-hexyl fluorene (M-36), and a 4 and 4'-difluoro azobenzene (P-26)

In the two-lot flask of 100ml ** equipped with the Dean Stark trap under nitrogen-gas-atmosphere mind 1.36g (2.38mmol) 2 and the 7-screw (4-hydroxy styryl) -9, a 9'-G n-hexyl fluorene, A 0.52g (2.38mmol) 4 and 4'-difluoro azobenzene and 0.6g (4.34mmol) potassium carbonate are put in. After adding the mixed solvent of 20ml NMP/CHP (1:1) and making it dissolve, raised reaction temperature at 150 degrees C, it was made to react for 6 hours, and moisture was removed completely. Subsequently, after raising 180 more degrees C and making said reaction temperature react for 20 hours, ordinary temperature was made to cool, said reactant was diluted by NMP, it was gradually dropped at 1l. water / methanol (1:1) solution, and the yellow polymer was deposited. Subsequently, after filtering the polymer which deposited and making it dissolve in chloroform, the polymer which was made to reprecipitate with a 1l. methanol and was refined was obtained. Subsequently, after filtering said obtained polymer and washing thoroughly in order of water and a methanol, it was made to fully dry in 40-degree C vacuum oven, and the polymer with a yellow of 0.71g (40% of yield) was obtained.

1 H-NMR (CDC13), delta0.58-1.24 (CH2 and CH3), 2.00 (br, s, CCH2), 6.98-8.01 (m, vinyl, and aromatic series).

[0135] Example 632, the 7-screw (4-hydroxyphenyl) -9, a 9'-G n-hexyl fluorene (M-29), and 2, 5-screw (4-fluoro phenyl) - Polymerization with 1, 3, and 4-OKISA diazole (P-27)

In the two-lot flask of 100ml ** equipped with the Dean Stark trap under nitrogen-gas-atmosphere mind 1.0g (1.9mmol) 2 and the 7-screw (4-hydroxyphenyl) -9, a 9'-G n-hexyl fluorene, 0.49g (1.9mmol) 2, 5-screw (4-fluoro phenyl) - 1, 3, and 4-OKISA diazole and 0.66g (4.8mmol) potassium carbonate are put in. After adding the mixed solvent of 20ml NMP/CHP (1:1) and making it dissolve, raised reaction temperature at 150 degrees C, it was made to react for 6 hours, and moisture was removed completely. Subsequently, after raising 180 more degrees C and making said reaction temperature react for 17 hours, ordinary temperature was made to cool, said reactant was diluted by NMP, it was gradually dropped at 1l. water / methanol (1:1) solution, and the yellow polymer was deposited. Subsequently, after filtering the polymer which deposited and making it dissolve in chloroform, the polymer which was made to reprecipitate with a 1l. methanol and was refined was obtained. Subsequently, after filtering said obtained polymer and washing thoroughly in order of an acetone, hot water, and a methanol, it was made to fully dry in 40-degree C vacuum oven, and the polymer with a white of 1.15g (81.8% of yield) was obtained.

1 H-NMR (CDC13), delta0.45-1.42 (m, CH2 and CH3), 1.78-2.38 (m, CCH2), 7.82-8.35 (m, aromatic series).

[0136] The polymerization of Example 642, the 7-screw (4-BUROMO phenyl) -9, a 9'-G n-hexyl fluorene (M-17), and a sodium sulfide (P-28)

5g (7.75mmol) 2 and the 7-screw (4-BUROMO phenyl) -9, the 9'-G n-hexyl fluorene, and the 0.6g (7.75mmol) sodium sulfide were put into the 100ml ampul flask equipped with the agitator, and ampul was sealed, after adding 65ml NMP and making it dissolve. Subsequently, after making said mixture react at 200 degrees C for 48 hours, ordinary temperature was made to cool temperature, ampul was opened wide, the reactant was gradually dropped at the 1l. methanol, and the polymer was deposited. Subsequently, after filtering the polymer which deposited and making it dissolve in chloroform, the polymer which was made to reprecipitate with a methanol and was refined was obtained. Subsequently, after it filtered said obtained polymer and the methanol washed thoroughly, it was made to fully dry in 40-degree C vacuum oven, and the polymer with a white of 3.03g (75% of yield) was obtained.

1 H-NMR (CDC13), delta0.73-1.06 (m, CH2 and CH3), 2.01 (br, s, CCH2), 7.34-7.80 (m, aromatic series).

[0137] The polymerization of Example 652, the 7-screw (4-carboxyl phenyl) -9, a 9'-G n-hexyl fluorene (M-11), and 1, the 4-screw (3-aminophenyl) -3 and 6-G hexyloxy benzene (P-29)

In the 50ml flask equipped with the agitator under nitrogen-gas-atmosphere mind, 0.718g (1.25mmol) 2 and the 7-screw (4-carboxyl phenyl) -9, a 9'-G n-hexyl fluorene, 0.575g (1.25mmol) 1 and the 4-screw (3-aminophenyl) -3, 6-G hexyloxy benzene, and a 0.4g calcium chloride are put in. After adding 3ml NMP, a 1ml pyridine, and 0.9ml triphenyl phosphate, it was made to react at 120 degrees C for 4 hours. Subsequently, after making ordinary temperature cool the temperature of said reaction mixture, it was gradually dropped at the 1l. methanol solution, and the polymer was deposited. Subsequently, after filtering the polymer which deposited and making it dissolve in chloroform, the polymer which was made to reprecipitate with a methanol and was refined was obtained. Subsequently, after it filtered said obtained polymer and the methanol washed thoroughly, it was made to fully dry in 40-degree C vacuum oven, and the polymer with a white of 1.2g (97% of yield) was obtained.

1 H-NMR (CDC13), delta0.75-1.66 (CH2 and CH3), 2.03 (br, s, CCH2), 4.10 (br, -OCH2), 7.03-7.99 (m, aromatic series, and NH).

[0138] The polymerization of an Example 662, 7-screw [4-(3, 4-dicarboxy phenoxy) phenylene vinyl]-9, and 9'-G n-hexyl full orange anhydride (M-37) and 4 and 4'-oxy-dianiline (P-30)

After having put 0.23g (1.15mmol) 4 and 4'-oxy-dianiline (ODA) into the round bottom flask, adding 4ml N-methyl pyrrolidone to it and making it dissolve in it under ordinary temperature and an argon ambient atmosphere, It added and the 0.99g (1.15mmol) 2, 7-screw [4-(3, 4-dicarboxy phenoxy) phenylene vinyl]-9, and 9'-G n-hexyl full orange anhydride and 7ml N-methyl pyrrolidone were made to react for 24 hours. Subsequently, having added the 0.55g (6.95mmol) pyridine and the 0.71g (6.95mmol) acetic anhydride, and maintaining the temperature of 120 degrees C, it was made to react for 6 hours and imide-ized. Subsequently, after it filtered the precipitate generated by water / methanol (1:1) solution by reprecipitating after making ordinary temperature cool the temperature of said reaction mixture and the methanol washed several times, reduced pressure drying was carried out at 40 degrees C, and polyimide with a thin yellow of 1.02g (86.1% of yield) was obtained. ¹ H-NMR (CDCl₃), delta 0.72-1.42 (m, CH₂ and CH₃), 1.62-2.38 (m, CCH₂), 6.75-8.10 (m, aromatic series, and vinyl).

[0139] Example 67 structure analysis, ultraviolet rays, photo luminescence, and an electroluminescence property: Drawing 1 and drawing 3 show the hydrogen nuclear-magnetic-resonance spectrum of the monomer (M-34) of Example 34, and the polymer (P-18) of Example 54, and drawing 2 shows the ultraviolet rays (it abbreviates to UV-Vis Ultraviolet-Visible and the following) and the photo-luminescence spectrum of a monomer (M-34) of Example 34, respectively. Here, when the manufacture approach of a macromolecule thin film was explained, after it dissolved in the 5ml chloroform solution and the 0.2-micron microfilter refined 0.1g (P-18) of polymers first, spin coating was performed, controlling a spin rate so that thin film thickness is set to about 100nm (usually 900 - 1200rpm). Subsequently, after carrying out ordinary temperature desiccation of the sample by which coating was carried out, UV spectrum value was calculated first and it asked for PL spectrum using the wavelength of the maximal value of UV peak searched for. Thus, the obtained result was shown in drawing 4. On the other hand, the configuration of an EL element made the component which has a configuration by ITO / luminous layer / electrode currently most generally used, and investigated EL property. Here, said luminous layer can use what blended the general-purpose giant molecule which mentioned it above, using the copolymer manufactured by said example as it is, for example, a polyvinyl carbazole, the poly methyl (meta) acrylate, polystyrene, an epoxy resin, etc. with the polymer applied to this invention with a chloroform solvent, and chose aluminum as an electrode. The component consisted of carrying out vacuum deposition of the aluminum to the top face of the luminous layer by which spin coating was carried out to the thickness of 100nm on the ITO glass substrate like the manufacture approach of of UV-Vis and PL spectrum test sample which were mentioned above as the production approach. typical — a polymer (P-18) — independent — and the result of EL spectrum of the polymer which blended with the polyvinyl carbazole and was obtained was shown in drawing 5 and drawing 6, respectively.

[0140]

[Effect of the Invention] The EL element which used the fluorene system compound concerning this invention, its polymer, and them by the approach explained above can be offered. Since it has light and electric activity while the fluorene system compound concerning this invention and its polymer can be applied to LED of an EL element etc., PL property, a non-linear optics property, light, and electrical conductivity are shown, and, therefore, the application to the optical switch using it, a sensor, a module, a wave guide, a transistor, laser, a light absorption object, and a macromolecule demarcation membrane is expected.

[Translation done.]

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TECHNICAL FIELD

[Field of the Invention] This invention relates to the EL element which used the acid addition salt of the new fluorene system compound which has an organic semiconductive polymer and a photoelectron ingredient, and the various functional groups that can be especially used as an EREKURO luminescence (it abbreviates to EL hereafter) ingredient, a fluorene system polymer, and a fluorene system polymer, and them.

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TECHNICAL FIELD

[Field of the Invention] This invention relates to the EL element which used the acid addition salt of the new fluorene system compound which has an organic semiconductive polymer and a photoelectron ingredient, and the various functional groups that can be especially used as an EREKURO luminescence (it abbreviates to EL hereafter) ingredient, a fluorene system polymer, and a fluorene system polymer, and them.

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EFFECT OF THE INVENTION

[Effect of the Invention] The EL element which used the fluorene system compound concerning this invention, its polymer, and them by the approach explained above can be offered. Since it has light and electric activity while the fluorene system compound concerning this invention and its polymer can be applied to LED of an EL element etc., PL property, a non-linear optics property, light, and electrical conductivity are shown, and, therefore, the application to the optical switch using it, a sensor, a module, a wave guide, a transistor, laser, a light absorption object, and a macromolecule demarcation membrane is expected.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, the fluorene system polymer which has various functional groups as a macromolecule EL ingredient is not manufactured, and even if applied, it is not. A structure check is possible, it is easy to dissolve in an organic solvent, and the purpose of this invention is to offer the new fluorene system compound applicable as EL ingredient and other photoelectron ingredients which has various functional groups, the acid addition salt of the polymer, and the EL element which used them as a luminescent material.

[Translation done.]

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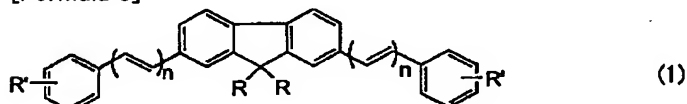
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MEANS

[Means for Solving the Problem] This invention is following formula (1): [0009].

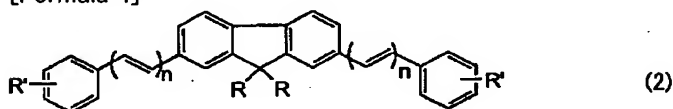
[Formula 3]



[0010] the inside of a formula, and R — the alkyl group of hydrogen, the aliphatic series of 1–22 carbon numbers, or an alicycle group, or an alkoxy group — It is the alkyl or the aryl derivative permuted by one or more sorts of the aryl of 6–18 carbon numbers, an aryloxy group or silicon, tin, and germanium. R' The functional group which exists in the meta or the para position of a phenyl group is shown. For example, the ether, Ester, amino, an amide, imide, the formyl, a ketone, a sulfone, A sulfide, nitroglycerine, cyano ** ethynyl, a halogen, carboxyl, A boric acid, vinyl, hydrazide, isocyanato, carbamoyl, a carbonate, the radical chosen from the group which consists of chloro methyl, the hydroxyl, an anhydride, SHIANATO, azomethine, a quinoline, OKISA diazole, and azo — it is — n — 0 or 1 — it is — it is related with the fluorene system compound shown.

[0011] In addition, this invention is following formula (2): [0012].

[Formula 4]



[0013] the inside of a formula, and R — the alkyl group of hydrogen, the aliphatic series of 1–22 carbon numbers, or an alicycle group, or an alkoxy group — It is the alkyl or the aryl derivative permuted by one or more sorts of the aryl of 6–18 carbon numbers, an aryloxy group or silicon, tin, and germanium. R' It is what showed the functional group which exists in the meta or the para position of a phenyl group. For example, the ether, ester, an amide, imide, a ketone, a sulfone, A sulfide, ethynyl, diethynyl one, vinyl, hydrazide, urea, It is the radical chosen from the group which consists of carbamoyl, a carbonate, azomethine, a quinoline, OKISA diazole, and azo. n 0 or 1 — it is — it is related with the fluorene system polymer which includes the product by the polymerization of a fluorene system compound different identically or mutually shown, or the product by the polymerization of the fluorene system compound shown by the above-mentioned formula (2), and other compounds.

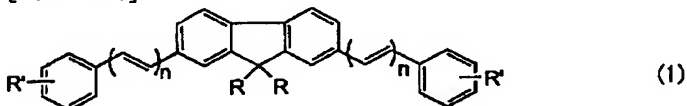
[0014] In addition, it is related with the EL element which uses one or more sorts chosen from the group which consists of an acid addition salt of the fluorene system compound of this invention, a fluorene system polymer, and a polymer as a luminescent material for the luminous layer of the EL element constituted by an anode plate / luminous layer / cathode, or an anode plate / electron hole transfer layer / luminous layer / cathode.

[0015]

[Embodiment of the Invention] The following formula (1) can show the fluorene system compound concerning this invention.

[0016]

[Formula 5]



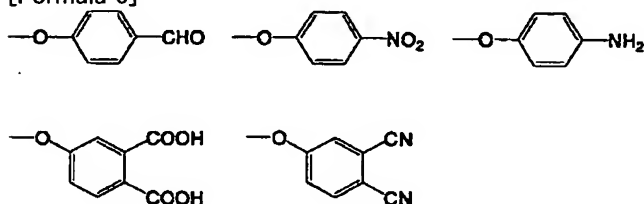
[0017] In the above-mentioned formula (1), R shows alkyl and aryl derivatives, such as the alkyl group of hydrogen, the aliphatic series of 1–22 carbon numbers, or an alicycle group or an alkoxy group, aryl of 6–18 carbon numbers, an aryloxy group or silicon, tin, and germanium. R' shows the functional group which exists in meta or a para position to a phenyl group. In addition, in the above-mentioned formula (1), n is 0 or 1.

[0018] Specifically as an example of R of the above-mentioned formula (1), hydrogen, methyl, ethyl, propyl, isopropyl, butyl, isobutyl, pentyl, hexyl, ethylhexyl one, heptyl, octyl, iso octyl, nonyl, DESHIRU, dodecyl, hexadecyl, octadecyl, DOKODESHIRU, cyclo propyl, cyclopentyl, cyclohexyl, methoxy, ethoxy ** butoxy, hexyloxy one, methoxy ethoxyethyl, methoxyethoxy ethoxyethyl, phenyl, phenoxy, tolyl, benzyl, naphthyl, or an anthryl radical is mentioned.

As an example of R which is the alkyl and the aryl derivative which were permuted in silicon, tin, germanium, etc., trimethylsilyl, triphenyl silyl, tributyltin, triethyl germanium, etc. are mentioned, for example.

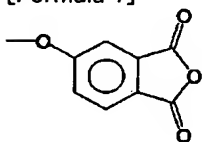
[0019] Moreover, in the above-mentioned formula (1), R' shows the functional group which exists in the meta or the para position of a phenyl group, it is easy to manufacture, and especially if excelled in a property, it will not be restricted. Although a functional group is formed and the ether, ester, amino, an amide, imide, the formyl, a ketone, a sulfone, a sulfide, nitroglycerine, cyano ** ethynyl, a halogen, carboxyl, a boric acid, vinyl, hydrazide, isocyanato, carbamoyl, a carbonate, chloro methyl, the hydroxyl, an anhydride, SHIANATO, azomethine, a quinoline, OKISA diazole, azo, others, etc. are included by the example, it is not limited to this. Alkyl carbonyl like alkoxy carbonyl; acetyl like alkynyl; carboxyl; ethoxycarbonyl like alkenyl; ethynyl like alkoxy; vinyl like cyano alkyl; methoxy like hydroxyalkyl; -CH₂CN like halo alkyl; -CH₂OH like alkyl; -CH₂Cl like hydroxy; -Br and halogen; CH₃ like -F as an example of the desirable functional group of R' including these; it is following radical: [0020].

[Formula 6]



The radical which comes out and is guided from the ether as shown; the following radical : [0021]

[Formula 7]



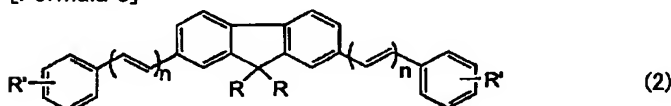
[0022] Radical; -B (OH) which comes out and is guided from an anhydride as shown 2, amino, nitroglycerine, the cyano ** formyl, SHIANATO, -COCl, and -CONHNH₂ are mentioned.

[0023] According to this invention, the maximum wavelength of photo luminescence can use preferably what is 300-600nm among the fluorene system compounds containing the above-mentioned functional group. Moreover, the fluorene system compound containing the above-mentioned functional group can be used as a luminescent material for the luminous layer of an EL element.

[0024] The fluorene system polymer concerning this invention includes the product by the polymerization of the fluorene system compound concerning this invention different identically or mutually shown by the following formula (2), and/or the product by the polymerization of the fluorene system compound concerning this invention, and other organic compounds.

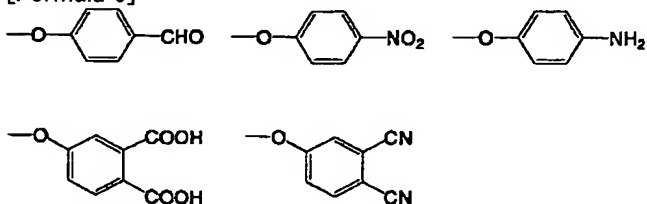
[0025]

[Formula 8]



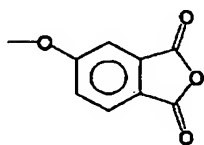
[0026] In a formula (2), n is 0 or 1. Moreover, it will not be limited, especially if manufacture is easy and excellent in EL property as a functional group shown by R and R'. For example, as R, what was illustrated about the above-mentioned formula (1) is applied. For example, R' is not limited to these, although it is the functional group which exists in meta or a para position to a phenyl group and the ether, ester, an amide, imide, a ketone, a sulfone, a sulfide, ethynyl, diethynyl one, vinyl, hydrazide, urea, carbamoyl, a carbonate, azomethine, a quinoline, OKISA diazole, azo, etc. are included as an example. Alkenyl; ethynyl like alkoxy; vinyl like cyano alkyl; methoxy like hydroxyalkyl; -CH₂CN like halo alkyl; -CH₂OH like alkyl; -CH₂Cl like hydroxy; -Br and halogen; CH₃ like -F as a desirable example of R' including these, alkyl carbonyl like alkoxy carbonyl; acetyl like alkynyl; carboxyl; ethoxycarbonyl like diethynyl one; it is following radical: [0027].

[Formula 9]



[0028] Radical of; following which comes out and is guided from a ether group as shown : [0029]

[Formula 10]



[0030] Radical; -B (OH) which comes out and is guided from an anhydride as shown 2, cyano ** amino, nitroglycerine, the formyl, SHANATO, -COCl, and -CONHNH₂ are mentioned.

[0031] If an inorganic acid or an organic acid is added in the case of the fluorene polymer with which said functional group contains an atom like nitrogen (when azomethine, a quinoline frame, etc. are included), while a salt as shown in [P-1-1] or [P-1-2] will be generated, for example, UV and the PL maximum wavelength change. For example, when a hydrochloric acid is added to [P-1] of an azomethine frame content fluorene polymer, the UV maximum wavelength changes to 355nm from 370nm, and that (photo luminescence was not seen) in which the PL maximum wavelength did not appear comes to emit light by 411nm.

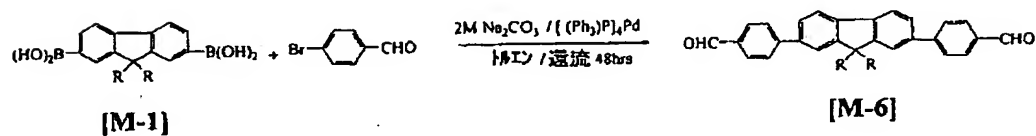
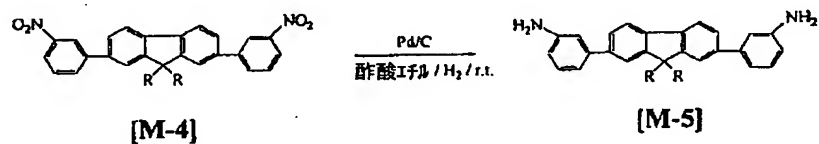
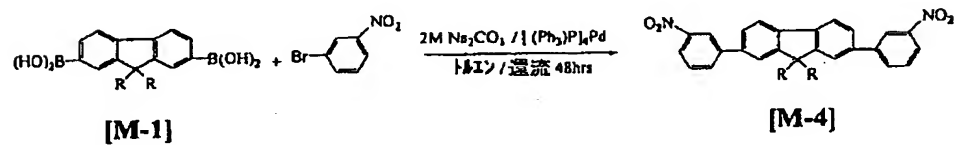
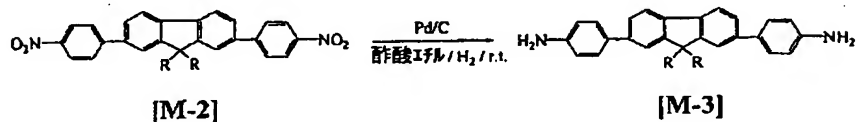
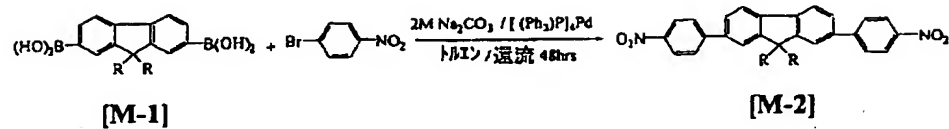
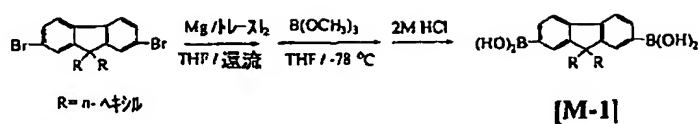
[0032] Moreover, this invention is a salt generated when an acid is added to the above-mentioned fluorene system polymer, and these acid addition salts are desirable. As for an acid, it is desirable that they are an inorganic acid or an organic acid. As for an inorganic acid or an organic acid, it is desirable that they are a hydrochloric acid or p-toluene sulfide. Moreover, p-toluenesulfonic acid is also desirable. as the fluorene system polymer which it is desirable that it is the acid addition salt of the fluorene system polymer which has azomethine, a quinoline, or an imide frame, and has these frames — polyazo methine, for example as shown in (P-1), and the poly quinoline as shown in (P-18) — or — and (P-19) — polyimide [like] is mentioned for or (P-30).

[0033] The acid addition salt of the fluorene system compound of this invention, a fluorene system polymer, and a polymer can be used as a luminescent material for the luminous layer of an EL element. Moreover, to the luminescent material of a luminous layer, it is desirable that they are the macromolecule which includes a polyvinyl carbazole, Pori (1, 4-hexyloxy - 2, 5-phenylenevinylene), or Pori (3-hexyl thiophene), and the EL element with which one or more sorts of the acid addition salt of a fluorene system compound, a fluorene system polymer, and a polymer are blended, and it is desirable to it that it is the EL element with which these macromolecules and a fluorene system polymer are blended especially.

[0034] The fluorene system compound (monomer) concerning this invention and its polymer can be manufactured by approach like the following reaction formula.

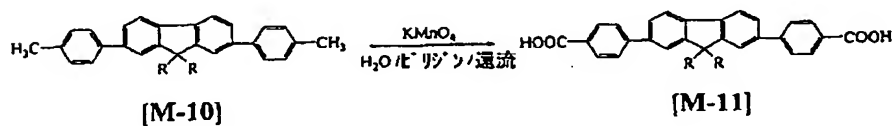
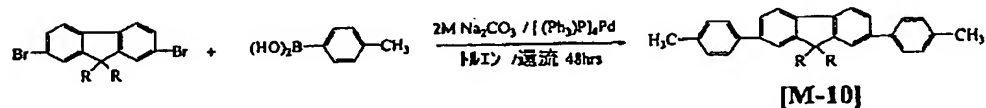
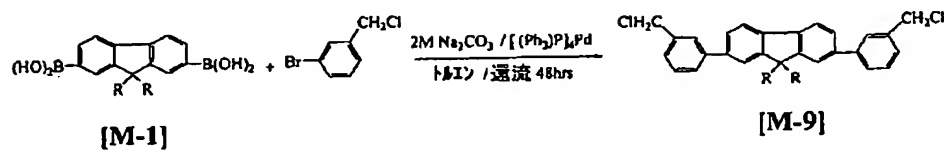
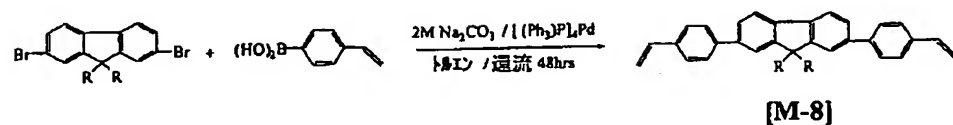
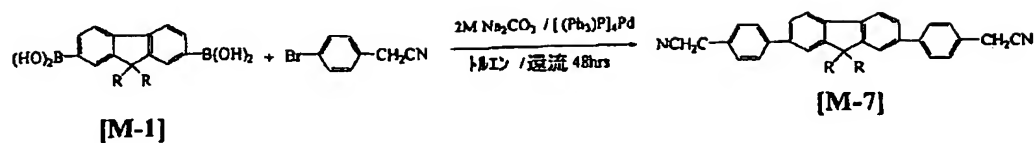
[0035]

[Formula 11]



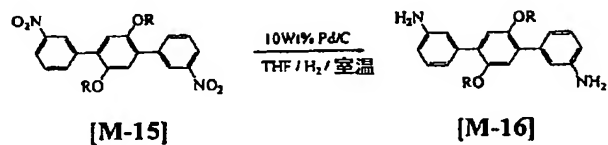
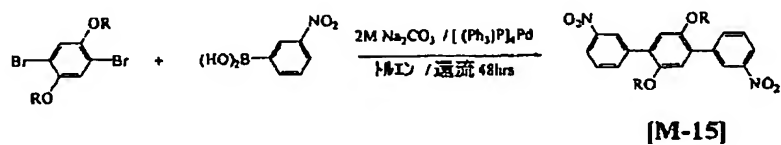
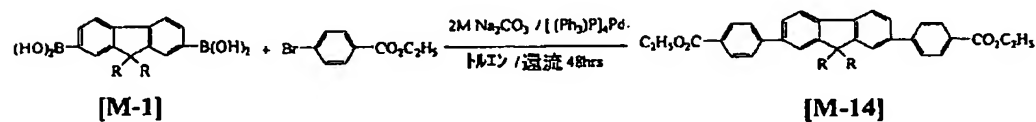
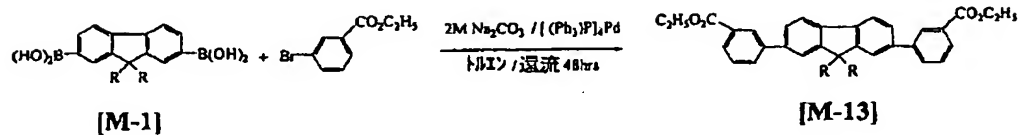
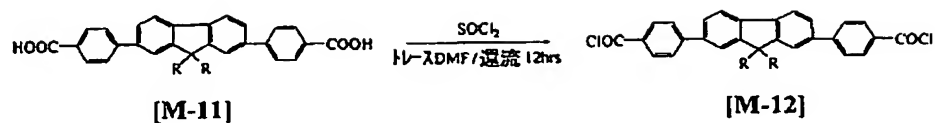
[0036]

[Formula 12]



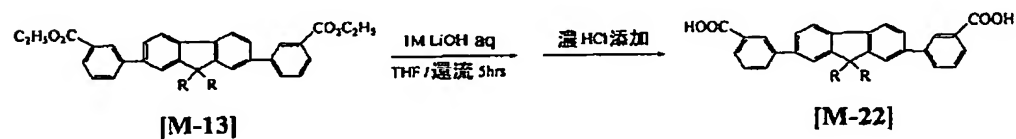
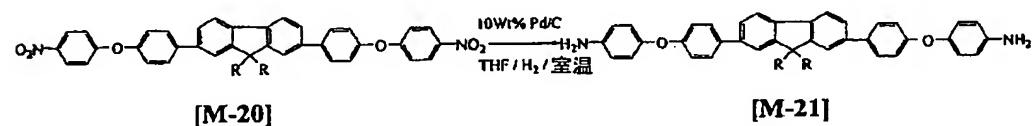
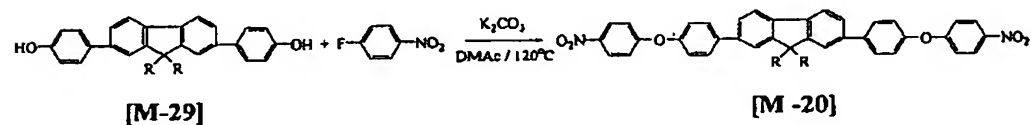
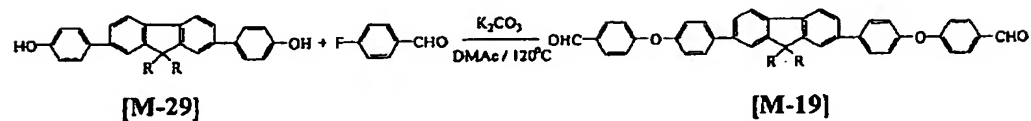
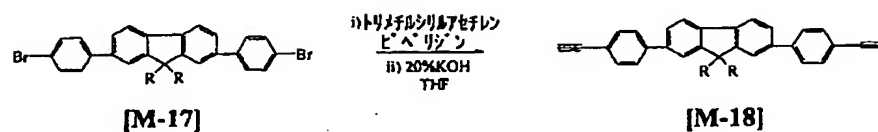
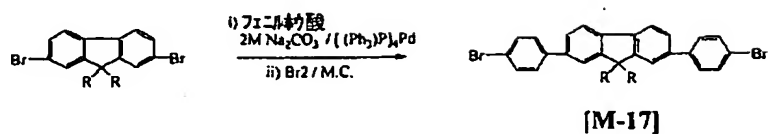
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[Formula 13]



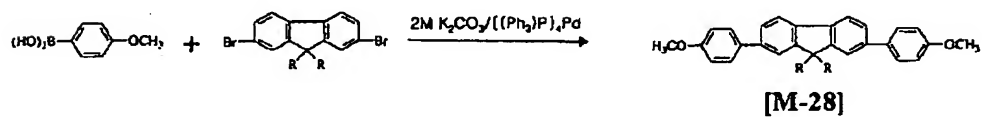
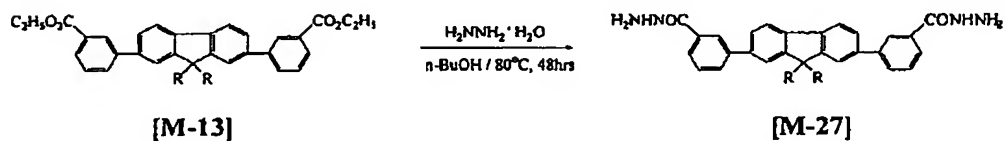
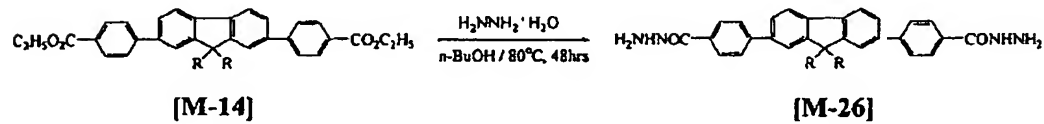
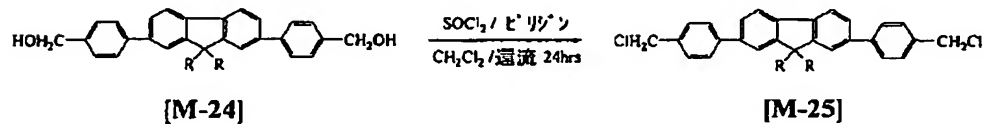
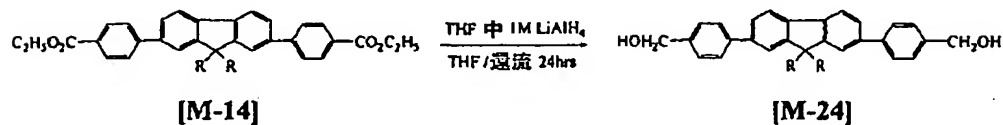
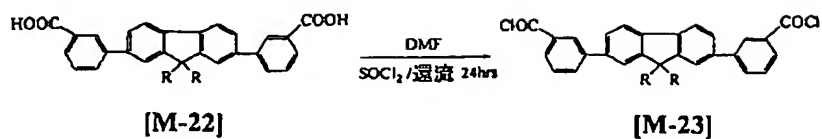
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[Formula 14]



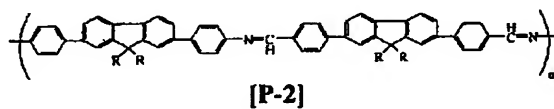
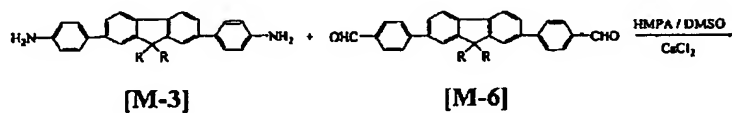
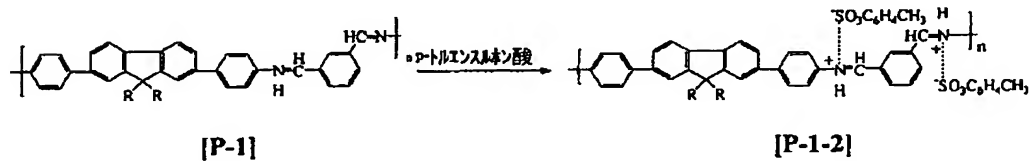
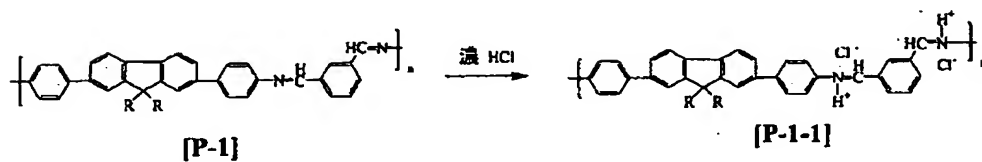
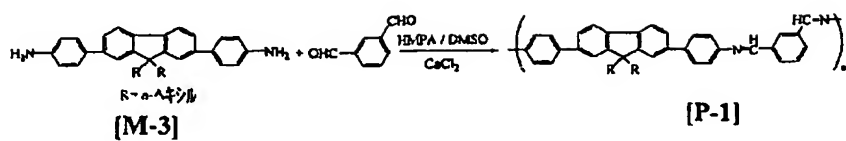
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[Formula 15]

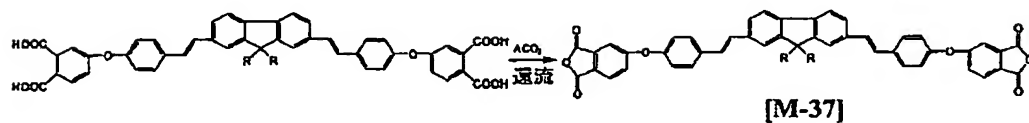
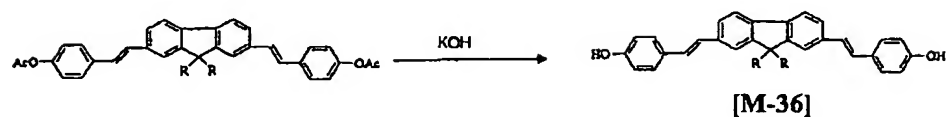
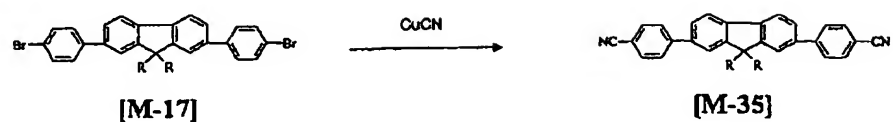


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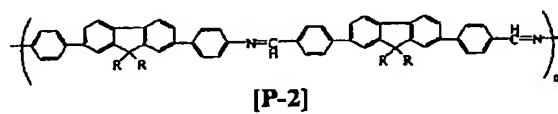
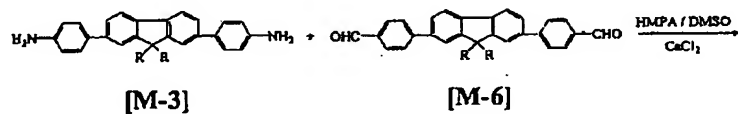
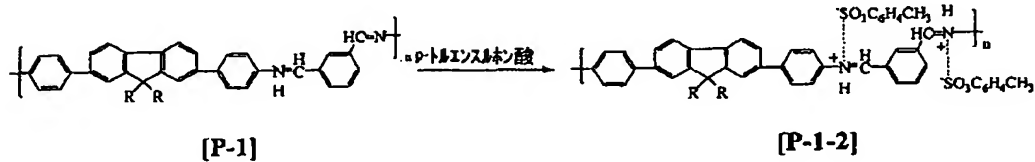
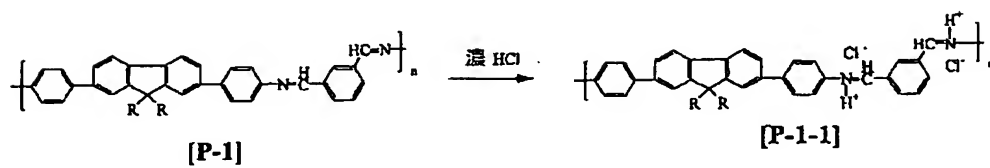
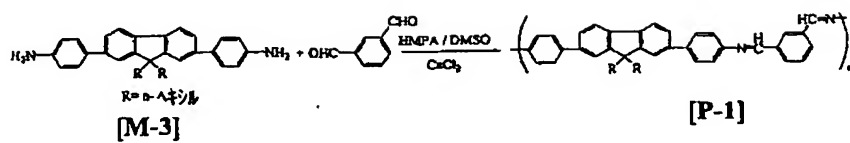
[Formula 16]



[0041]
[Formula 17]

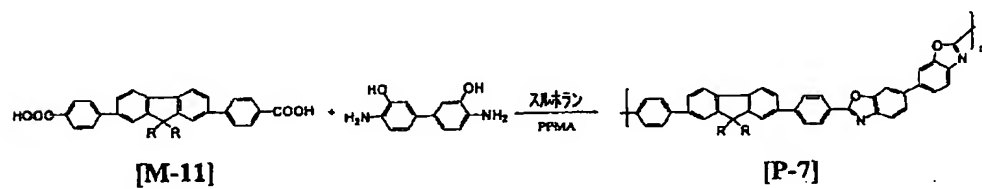
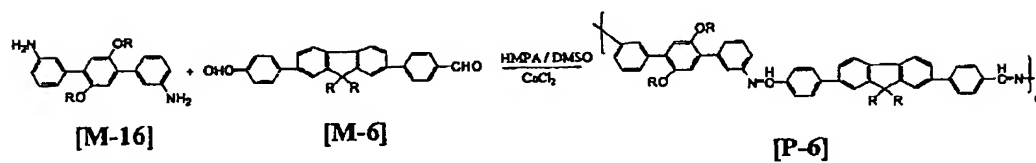
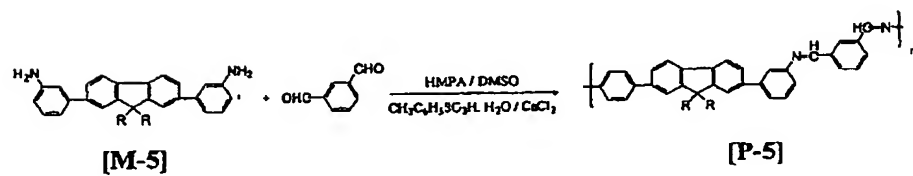
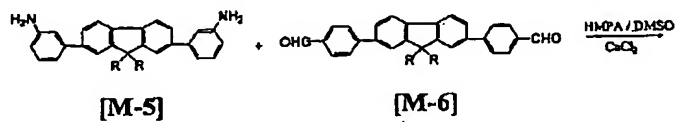
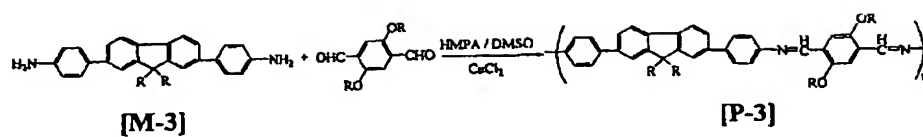


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[Formula 18]



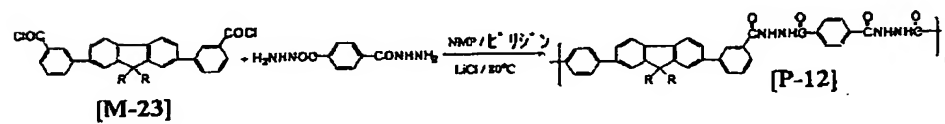
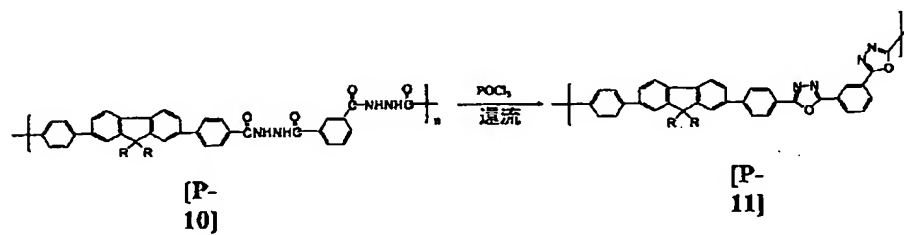
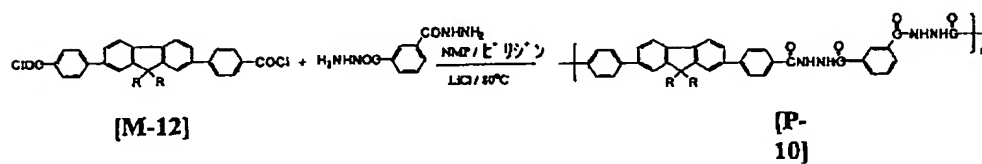
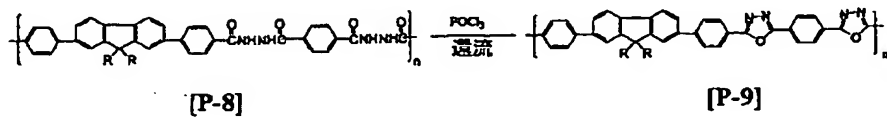
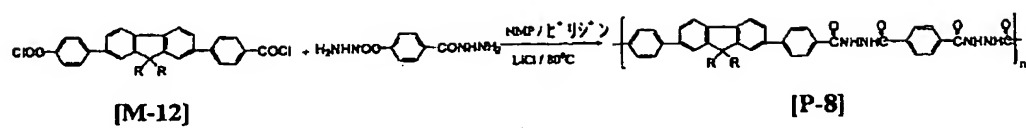
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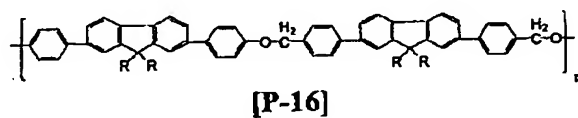
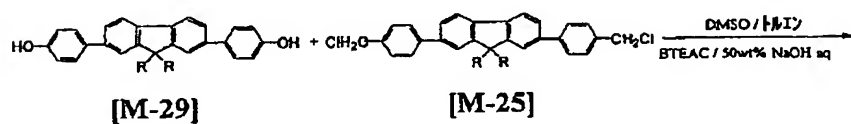
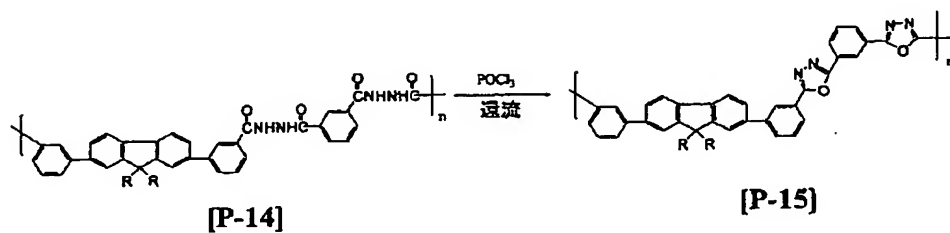
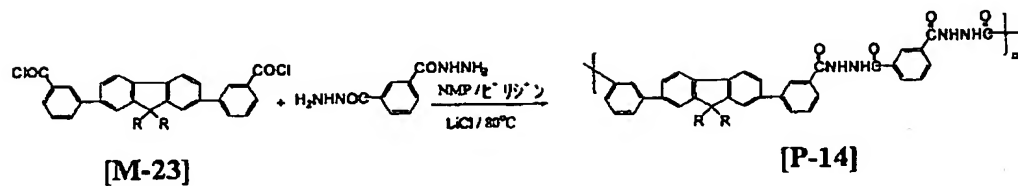
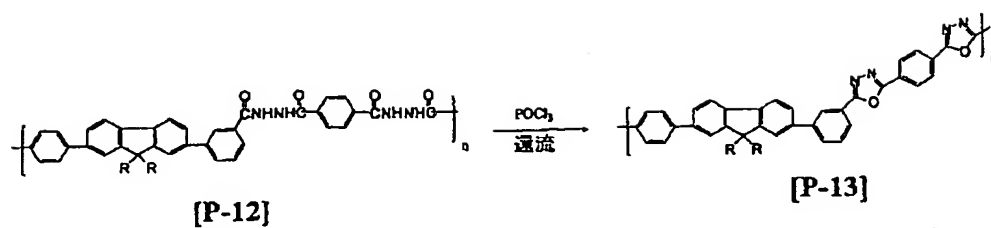


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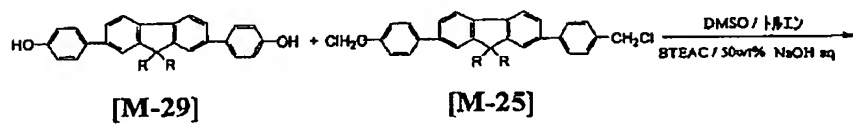
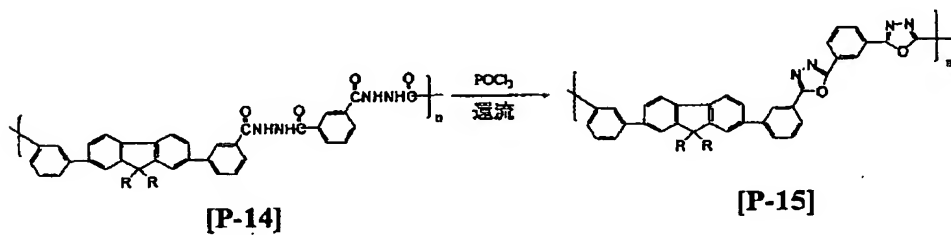
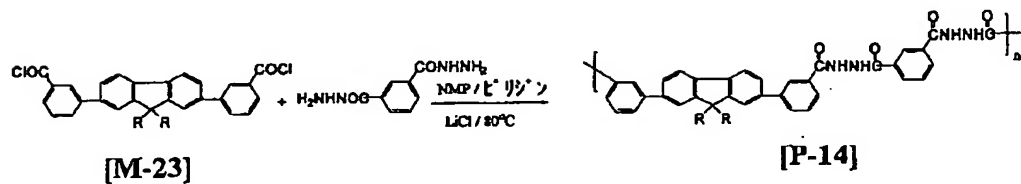
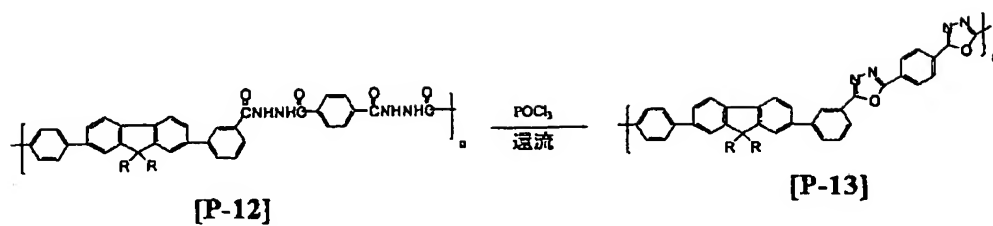
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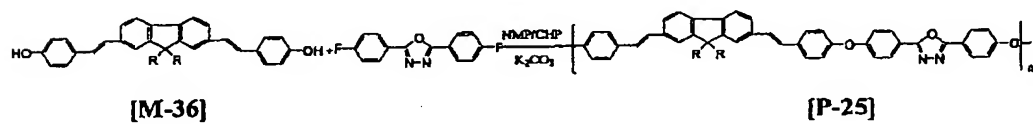
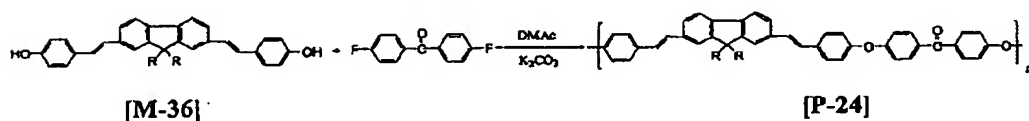
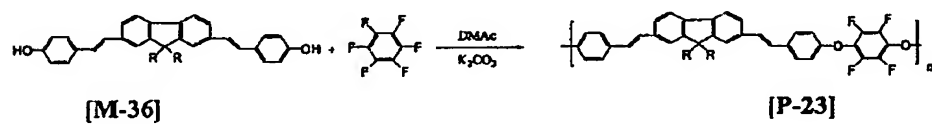
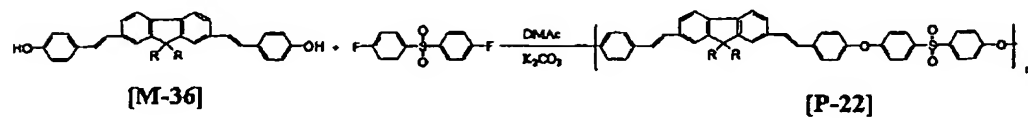
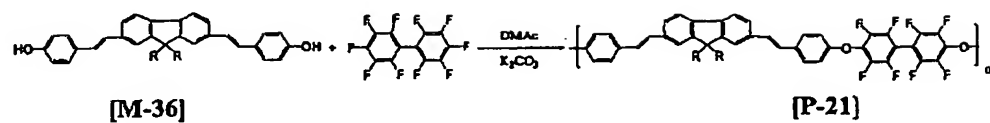
[0045]
[Formula 21]



[0046]
[Formula 22]

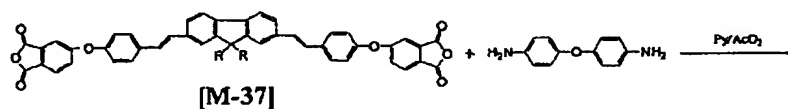
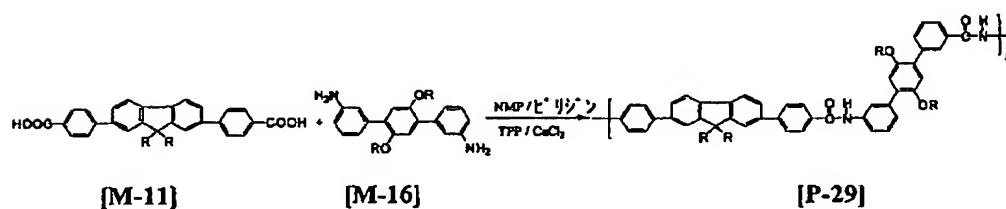
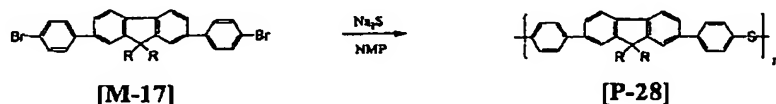
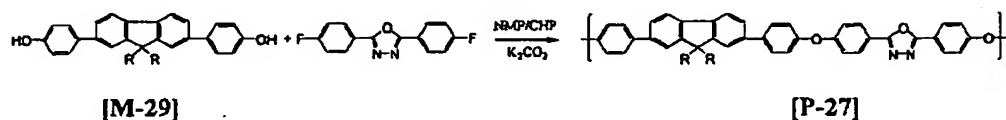
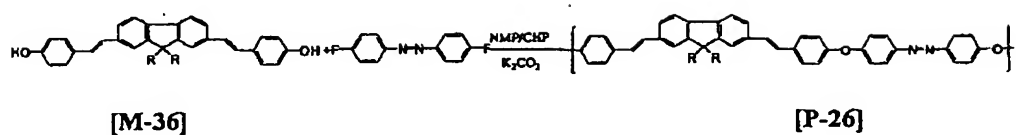


[0047]
[Formula 23]



[0048]

[Formula 24]



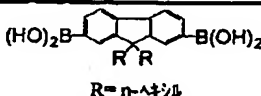
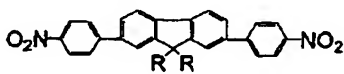
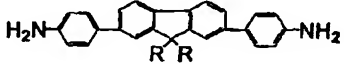
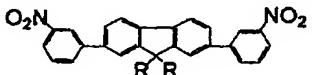
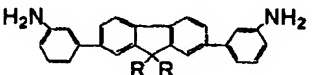
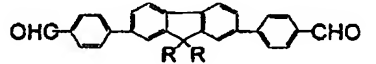
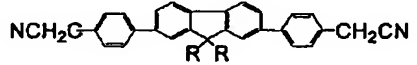
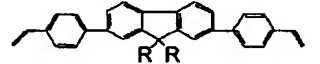
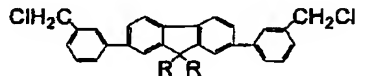
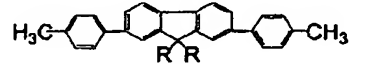
[0049] In addition, as long as the structure of the last matter other than an approach which was mentioned above is the same, what kind of well-known approach may be used for manufacture of the fluorene system compound concerning this invention, and/or its polymer. That is, it is not necessary to limit especially a solvent, reaction temperature, concentration, or a catalyst for manufacturing the fluorene system compound and/or polymer concerning this invention etc., and manufacture yield is not limited, either.

[0050] Those luminescence properties are shown in the structure list of other monomers to which the next table 1 uses a fluorene system compound and a fluorene system polymer in case R is n-hexyl group for generation. Examples 1-40 explain the check of those manufacture approaches and structure to a detail.

[0051]

[Table 1]

表1

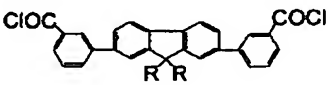
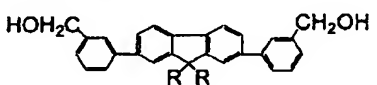
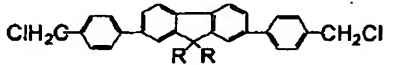
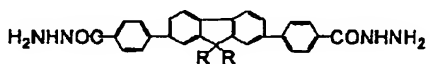
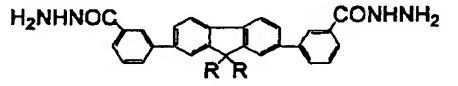
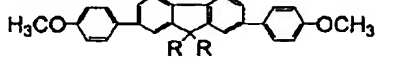
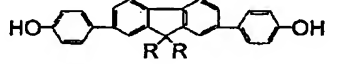
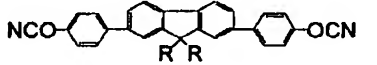
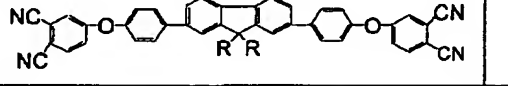
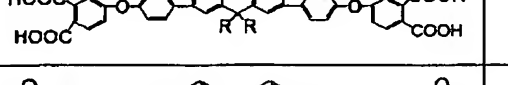
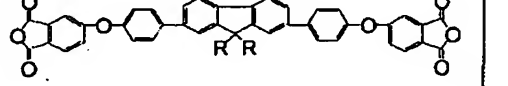
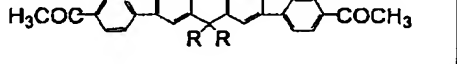
モノマー	構造 (R = n-ヘキシル)	UV(λ_{max}) (nm)	PL(λ_{max}) (nm)	融点(°C)
[M-1]	 R = n-ヘキシル	290 / 316	334	188-191
[M-2]		374	-	134-136
[M-3]		344	397	79-80
[M-4]		362	-	128-129
[M-5]		333	386	135-136
[M-6]		354	428	120-121
[M-7]		330	367/383	104-105
[M-8]		344	388/407	106-107
[M-9]		328	386/405	97-98
[M-10]		332	374	88-89

[0052]
[Table 2]

モノマー	構造 (R = n-ヘキシル)	UV(λ_{max}) (nm)	PL(λ_{max}) (nm)	融点(°C)
[M-11]		344	394	290-293
[M-12]		364	432	130-131
[M-13]		330	388/382	94-95
[M-14]		344	390/406	100-101
[M-15]		328	-	126-127
[M-16]		320	390	105-106
[M-17]		332	368/386	12-123
[M-18]		340	382	101-102
[M-19]		334	378/482	86-88
[M-20]		334	-	102-103
[M-21]		335	375/393	57-58
[M-22]		330	404	227-229

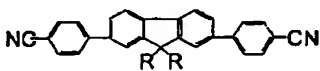
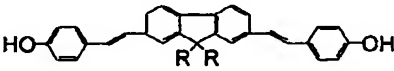
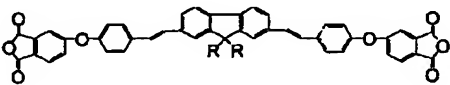
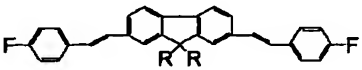
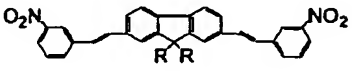
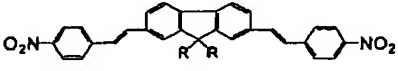
[0053]

[Table 3]

モノマー	構造 (R = n-ヘキシル)	UV(λ_{max}) (nm)	PL(λ_{max}) (nm)	融点(°C)
[M-23]		328	445	113-114
[M-24]		330	368/386	58-59
[M-25]		334	438	104-105
[M-26]		343	406	134-136
[M-27]		332	370/386	108-108
[M-28]		334	372/388	104-105
[M-29]		340	397	142-143
[M-30]		330	365/380	125-126
[M-31]		332	364	183-184
[M-32]		350	414	214-215
[M-33]		332	374	187-188
[M-34]		350	414	130-131

[0054]

[Table 4]

モノマー	構造 (R = n-ヘキシル)	UV(λ_{max}) (nm)	PL(λ_{max}) (nm)	融点(°C)
[M-35]		342	389/404	113-115
[M-36]		378	415/438	98-97
[M-37]		380	429	190-193
[M-38]		372	407/430	110-111
[M-39]		376	-	189-192
[M-40]		374	-	164-168

[0055] The next table 2 shows the structures and those luminescence properties of a fluorene system polymer in case R is n-hexyl group. Examples 41-66 explain the check of those manufacture approaches and structure to a detail.

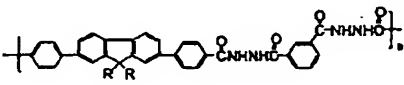
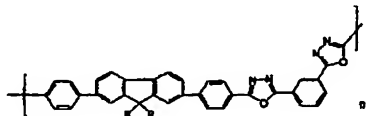
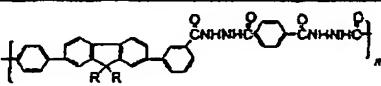
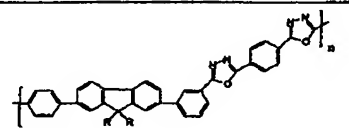
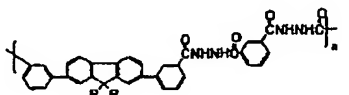
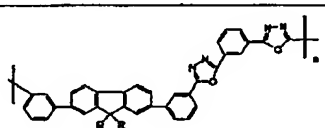
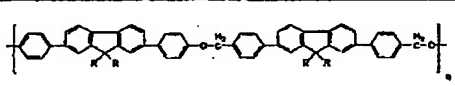
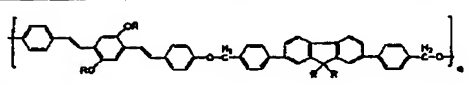
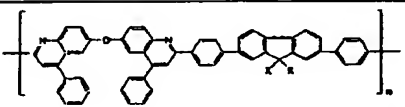
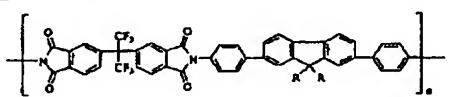
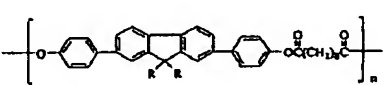
[0056]

[Table 5]

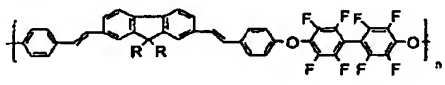
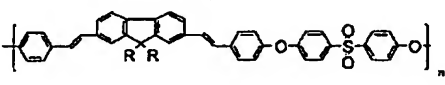
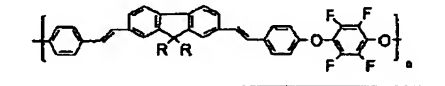
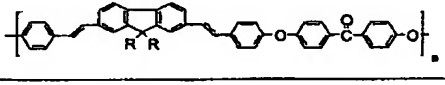
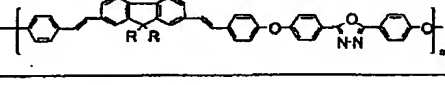
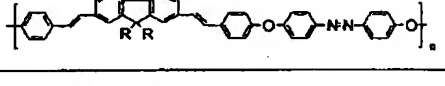
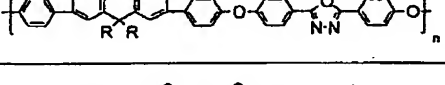
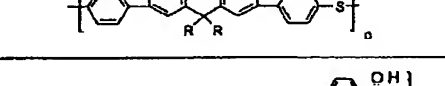
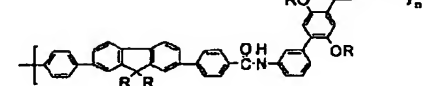
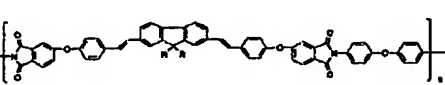
表2

重合体	構造 (R=n-キシル)	UV(λ_{max}) (nm)	PL(λ_{max}) (nm)	$M_w \times 10^{-3}$	P.D.I.
[P-1]		370	-	19.9	2.54
[P-1-1]		355	411	-	-
[P-1-2]		348	418	-	-
[P-2]		380	-	10.7	2.49
[P-3]		333	375	9.6	1.82
[P-4]		360	-	19.2	2.44
[P-5]		320	-	18.6	3.61
[P-6]		362	425	4.8	1.88
[P-7]		-	-	-	-
[P-8]		344	400	10.5	1.9
[P-9]		366	454	-	-

[0057]
[Table 6]

重合体	構造 (R= n-ヘキシル)	UV(λ_{max}) (nm)	PL(λ_{max}) (nm)	$M_w \times 10^{-3}$	P.D.I.
[P-10]		344	407	11.7	2.0
[P-11]		358	432	-	-
[P-12]		334	386	12.3	2.1
[P-13]		333	490	-	-
[P-14]		334	379	12.7	1.7
[P-15]		326	398	-	-
[P-16]		338	378/392	89.0	2.6
[P-17]		334	448/475	76.2	2.4
[P-18]		374	431	40.3	3.38
[P-19]		334	367	$\eta_{inh}=1.2dl/g$ (30°C, 0.5g/dl, NMP)	-
[P-20]		330	366/383	29.9	2.53

[0058]
[Table 7]

重合体	構造 (R=n-ヘキシル)	UV(λ_{max}) (nm)	PL(λ_{max}) (nm)	$M_n \times 10^{-3}$	P.D.I.
[P-21]		378	415/438	258.8	3.57
[P-22]		380	417/443	100.9	3.8
[P-23]		378	417/438	98.8	6.24
[P-24]		380	418/442	28.2	2.66
[P-25]		380	417/440	235.3	3.95
[P-26]		384	418/443	13.7	2.28
[P-27]		338	373/389	185.2	3.34
[P-28]		346	395	5.8	1.86
[P-29]		342	407	$\eta_{inh}=0.6dl/g$ (30°C, 0.5g/dl, DMAc)	-
[P-30]		382	-	$\eta_{inh}=1.07dl/g$ (30°C, 0.5g/dl, NMP)	-

[0059] The luminescence property shown in said Table 1 and 2 was measured by the approach explained in Example 67, and the same approach.

[0060] Organic [concerning this invention] and a macromolecule system EL element, and/or other optical elements are manufactured as a main ingredient for luminescence using the fluorene system compound which has various structures and functional groups as shown in said Table 1 and 2, and its polymer.

[0061] The fluorene system compound and/or polymer concerning this invention can already be used as an EL ingredient as it is by thin film-ization using well-known approaches, such as vacuum deposition, spin coating, roll coating, bar coating, and ink jet coating. The method with which the configuration of an EL element locates the usual luminous layer ingredient between an anode plate and cathode, namely, the gestalt of the most typical component of an anode plate / luminous layer / cathode — in addition, the ingredient (the Japanese patent application public presentation Taira No. 135361 [two to] official report —) of an electron hole transfer layer or an electron transport layer Together, it constitutes using this Taira No. 152184 [three to] official report, and this Taira No. 207170 [six to] official report, namely, all gestalten like an anode plate / electron hole transfer layer / luminous layer / electron transport layer / cathode are not included, and it is not restricted to especially a configuration method.

[0062] An organic-semiconductor compound like metals, such as ITO, gold, copper, tin oxide, and a zinc oxide, and a metallic oxide or polypyrrole, the poly aniline, and the poly thiophene is able to use the ingredient usually covered by the thickness of 10nm – 1 micrometer as electrode material for transparent support substrates, such as glass, a transparent plastic, and a quartz, as said anode plate here. Moreover, sodium, magnesium, calcium, aluminum, an indium, silver, gold and metallic materials like copper, or those quality of an alloy can be used as said cathode.

[0063] When a concrete example is given, as said electron hole transfer layer A polyvinyl carbazole, 2, 5-screw (4'-diethylaminophenyl) – 1, 3, and 4-OKISA diazole or N, N'-diphenyl-N, N'-(3-methylphenyl)-1, and 1'-biphenyl-4,4'-

diamine (TPD) etc. as said electron transport layer tris (8-hydroxyquinolate) aluminum and 2-(4'-tert-butylphenyl)-5-(4''-biphenyl)- 1, 3, and 4-OKISA diazole — or 2, 4, and 7-trinitro-9-full — me — a well-known compound like non — vacuum evaporation technique, spin coating, casting, and LB — it can be used using the well-known thin film formation approaches, such as law, being able to apply.

[0064] In addition, the polymer which is applied to said electron hole transfer layer, an electron transport layer, or this invention in the luminescent material concerning this invention and which carries out mutual difference, Or it is also possible to use it, blending with PPV of fusibility and an existing luminescence polymer like a PTh derivative. For example, a polyvinyl carbazole, Pori (1, 4-hexyloxy - 2, 5-phenylenevinylene), or Pori (3-hexyl thiophene) etc., The polymer concerning this invention can be used applying it by spin coating or the casting approach, after making it dissolve in an organic solvent like chloroform. Although it is not necessary to limit especially, to a polyvinyl carbazole, the concentration at this time adjusts the luminescence giant molecule concerning this invention so that it may become 0.1 - 50% preferably 0.001 to 99%, and as 5nm - 5 micrometers of thickness of a thin film are preferably set to 50nm - 1 micrometer, it can be used further.

[0065] Moreover, the light emitting device concerning this invention and the macromolecule which is dissolved in a common organic solvent and can form a thin film, It is also possible to blend and use it in the range of the concentration mentioned above and thickness. As an usable macromolecule For example, the poly methyl (meta) acrylate, Pori (meta) acrylate, Polystyrene, a polycarbonate, a polyvinyl chloride, polyethylene, Polypropylene, a polyacrylonitrile, a polyvinyl pyrrolidone, polyvinyl alcohol, Polyvinyl acetate, a polyvinyl butyral, a polyvinyl amine, The poly caprolactone, polyethylene terephthalate, polybutylene terephthalate, Polyurethane, ABS, polysulfone, and thermoplastic plastics like the Pori fluoride [vinyl] object, Or a furan, a melamine, a phenol, silicone, epoxy, and general-purpose resin like nylon (trademark) are included by polyester, such as polyacetal, a polyamide, polyimide, and alkyd resin, polyurea, and the list.

[Translation done.]

* NOTICES *

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1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

EXAMPLE

[Example] Hereafter, this invention is not restricted by these examples although this invention is more concretely explained based on an example.

[0067] The synthetic example 19 of a monomer, the 9'-G n-hexyl fluorene -2, the synthetic agitator of 7-JIBORETO (M-1), In the three-lot flask of 1 liter capacity equipped with the thermometer and the reflux capacitor 60.0g (0.12 mols) 2 and 7-dibromo -9, a 9'-dihexyl fluorene, and 11.9g (0.49 mols) magnesium are put in under an argon ambient atmosphere. After dissolving in a 400ml tetrahydrofuran (THF), added a small amount of iodine, it was made to flow back at 70 degrees C for 6 hours, and the Grignard reagent of transparent brown was obtained. subsequently, anhydrous, after adding 38.0g (0.36 mols) trimethyl borate [B(OCH₃)₃] in the 2l. flask of three lots with which the mechanical agitator was installed and making it cool with dry ice -- after dropping said Grignard reagent at the solution dissolved in THF gradually and making it agitate at -78 degrees C for 2 hours, it agitated for two days in ordinary temperature. Subsequently, after adding gradually 500ml of solution of hydrochloric acid of 2M to said mixed solution, it agitated for 3 hours and the solution of transparent yellow was obtained. Subsequently, after diethylether's having extracted said solution 3 times and drying this extract with a magnesium sulfate anhydride, it filtered, the solvent was removed and the solid-state of dark brown was obtained. Subsequently, after having made the acetone/hexane (20:80) recrystallize said solid-state, obtaining the solid-state of a snow-white color and filtering this solid-state, it was made to fully dry in 40-degree C vacuum oven, and the 30g (58.8% of yield) product was obtained. The melting point was 188-189 degrees C.

1 H-NMR (DMSO-d₆), delta 0.42 (br, 6H, CH₃), 0.61-0.91 (t, 16H, CH₂), 1.9 (br, s, 4H, CCH₂), 7.73-7.81 (d, 6H, aromatic series), 8.04 (s, 4H, OH) [0068] Example 22, 7-screw - (4-nitrophenyl) The synthetic agitator of a -9 and 9'-G n-hexyl fluorene (M-2), In the three-lot flask of 500ml ** equipped with the thermometer and the reflux capacitor The bottom of an argon ambient atmosphere, the 5.0g (11.8mmol) 9 and 9'-G n-hexyl fluorene -2, 7-JIBORETO, 5.26g (26.0mmol) 4-BUROMO nitrobenzene (BrC₆H₄NO₂) and 0.3g (0.26mmol) tetrakis(triphenyl phosphine)palladium [(PPh₃)₄] (O) Pd are put in, and it dissolves in 140ml toluene -- making -- further -- 2M -- The 65ml sodium-carbonate solution was added and it was made to flow back for 48 hours. Subsequently, after it reduced temperature to the room temperature after the completion of a reaction and toluene extracted 3 times, rinsed the extract several times and it was made to dry with a magnesium sulfate anhydride, it filtered, and after the mixed solvent of a hexane/methylene chloride (1:1) refined the liquid with the viscosity which removed and obtained the solvent using the silica gel column, it was made to recrystallize with the mixed solvent of ethyl acetate/hexane, and the detailed yellow crystal was obtained. Subsequently, the obtained crystal was fully dried in 40-degree C vacuum oven, and the 5g (73.2% of yield) product was obtained. The melting point was 134-136 degrees C.

1 H-NMR (CDCl₃), delta 0.72-1.12 (m, 22H, CH₂ and CH₃), 2.04-2.12 (m, 4H, CCH₂), 7.62-7.81 (m, 14H, aromatic series) [0069] In the two-lot flask of 500ml ** equipped with Example 32, the 7-screw (4-aminophenyl) -9, and the synthetic agitator of a 9'-G n-hexyl fluorene (M-3) After putting in 4.0g (6.9mmol) 2 and the 7-screw (4-nitrophenyl) -9, a 9'-G n-hexyl fluorene, and 10wt(s)% activated carbon support palladium (Pd/C) 1g and making it dissolve in 50ml ethyl acetate, It was made to react in ordinary temperature for 24 hours, making it filled up with hydrogen gas. Subsequently, after the methylene chloride solvent refined the liquid with the viscosity which removed and obtained the solvent after the reaction was completed, and putting in a magnesium sulfate anhydride, making it dry and filtering using the silica gel column, it was made to recrystallize with a methanol and the detailed white crystal was obtained. Subsequently, the obtained crystal was fully dried in 40-degree C vacuum oven, and the 2.2g (65.0% of yield) product was obtained. The melting point was 79-81 degrees C.

1 H-NMR (CDCl₃), delta 0.72-1.15 (m, 22H, CH₂ and CH₃) and 1.96- 2.04 (m, 4H, CCH₂), 3.67 (Br, s, 4H, NH₂), and 6.76-7.72 (m, 14H, aromatic series) [0070] Example 42, the 7-screw (3-nitrophenyl) -9, the synthetic mechanical agitation machine of a 9'-G n-hexyl fluorene (M-4), In the three-lot flask of 1 liter capacity equipped with the thermometer and the reflux capacitor The bottom of an argon ambient atmosphere, 40.0g (81.3mmol) 2 and 7-dibromo -9, a 9'-G n-hexyl fluorene, 29.8g (0.178mmol) 3-nitrobenzene borate (O₂NC₆H₄B (OH) 2) and 0.93g (0.81mmol) tetrakis(triphenyl phosphine)palladium are put in, and it dissolves in 300ml toluene -- making -- further -- 2M -- The 150ml sodium-carbonate solution was added and it was made to flow back for 48 hours. Subsequently, after the mixed solvent of ethyl acetate/hexane (1:3) refined the liquid with the viscosity which removed and obtained the solvent after having rinsed the extract several times, having made it dry with a magnesium sulfate anhydride after it reduced temperature to the room temperature after the completion of a reaction and toluene extracted 3 times, and filtering using the silica gel column, it was made to recrystallize with the mixed solvent of ethyl acetate/hexane, and the detailed yellow crystal was obtained. Subsequently, the obtained crystal was fully

dried in 40-degree C vacuum oven, and the 25g (53.3% of yield) product was obtained. The melting point was 135–136 degrees C.

1 H-NMR (CDCl₃), delta 0.72–1.13 (m, 22H, CH₂ and CH₃), 2.06–2.14 (m, 4H, CCH₂), 7.62–8.56 (m, 14H, aromatic series) [0071] In the two-lot flask of 500ml ** equipped with Example 52, the 7-screw (3-aminophenyl) -9, and the synthetic agitator of a 9'-G n-hexyl fluorene (M-5) 9.0g (15.6mmol) 2 and the 7-screw (3-nitrophenyl) -9, a 9'-G n-hexyl fluorene, It was made to react in ordinary temperature for 24 hours, after putting in 10wt(s)% activated carbon support palladium (Pd/C) 1.5g and making it dissolve in 100ml ethyl acetate, making it filled up with hydrogen gas. After the mixed solvent of ethyl acetate/hexane (1:1) refined the liquid with the viscosity which removed and obtained the solvent after the reaction was completed, and putting in a magnesium sulfate anhydride, making it dry and filtering using the silica gel column, it was made to recrystallize with the mixed solvent of diethylether/methanol, and the white crystal was obtained. Subsequently, the obtained crystal was fully dried in 40-degree C vacuum oven, and the 6.5g (80% of yield) product was obtained. The melting point was 120–121 degrees C.

1 H-NMR (CDCl₃), delta 0.76–1.16 (m, 22H, CH₂ and CH₃) and 2.02–2.10 (m, 4H, CCH₂), 3.77 (br, s, 4H, NH₂), and 6.72–7.79 (m, 14H, aromatic series) [0072] Example 62, the 7-screw (4-aldehyde phenyl) -9, the synthetic agitator of a 9'-G n-hexyl fluorene (M-6), In the three-lot flask of 500ml ** equipped with the thermometer and the reflux capacitor The bottom of an argon ambient atmosphere, the 5.0g (11.8mmol) 9 and 9'-G n-hexyl fluorene -2, 7-JIBORETO, After putting in 4.8g (26.0mmol) 4-BUROMO benzaldehyde (BrC₆H₄CHO) and 0.3g (0.26mmol) tetrakis(triphenyl) phosphinepalladium and making it dissolve in 140ml toluene, Furthermore, the sodium-carbonate solution (2M and 65ml) was added, and it was made to flow back for 48 hours. Subsequently, after the methylene chloride solvent refined the liquid with the viscosity which removed and obtained the solvent after having rinsed the extract several times, having made it dry with a magnesium sulfate anhydride after it reduced temperature to the room temperature after the completion of a reaction and toluene extracted 3 times, and filtering using the silica gel column, it was made to recrystallize with the mixed solvent of ethyl acetate/hexane, and the yellow crystal was obtained. Subsequently, the obtained crystal was fully dried in 40-degree C vacuum oven, and the 5.0g (77.8% of yield) product was obtained. The melting point was 128–129 degrees C.

1 H-NMR (CDCl₃), delta 0.71–1.12 (m, 22H, CH₂ and CH₃), 2.03–2.11 (m, 4H, CCH₂), 7.62–8.02 (m, 14H, aromatic series), 10.08 (s, 2H, CHO) [0073] Example 72, the 7-screw (4-acetonitrile phenyl) -9, the synthetic agitator of a 9'-G n-hexyl fluorene (M-7), In the three-lot flask of 500ml ** equipped with the thermometer and the reflux capacitor The bottom of an argon ambient atmosphere, the 9.0g (16.58mmol) 9 and 9'-G n-hexyl fluorene -2, 7-JIBORETO, 7.15g (36.47mmol) 4-BUROMO phenylacetonitrile (BrC₆H₄CH₂CN) and 0.42g (0.36mmol) tetrakis(triphenyl) phosphinepalladium are put in, and it dissolves in 180ml toluene — making — further — 2M — The 90ml sodium-carbonate solution was added and it was made to flow back for 48 hours. Subsequently, after the mixed solvent of ethyl acetate/hexane (1:2) refined the liquid with the viscosity which removed and obtained the solvent after having rinsed the extract several times, having made it dry with a magnesium sulfate anhydride after it reduced temperature to the room temperature after the completion of a reaction and toluene extracted 3 times, and filtering using the silica gel column, it was made to recrystallize with the mixed solvent of ethanol/chloroform, and the yellow crystal was obtained. Subsequently, the obtained crystal was fully dried in 40-degree C vacuum oven, and the 4.7g (50% of yield) product was obtained. The melting point was 104–105 degrees C.

1 H-NMR (CDCl₃), delta 0.72–1.07 (m, 22H, CH₂ and CH₃) and 2.01–2.18 (m, 4H, CCH₂), 3.83 (s, 4H, CH₂CN), and 7.42–7.81 (m, 14H, aromatic series) [0074] Example 82, the 7-screw (4-vinyl phenyl) -9, the synthetic agitator of a 9'-G n-hexyl fluorene (M-8), In the three-lot flask of 500ml ** equipped with the thermometer and the reflux capacitor The bottom of a nitrogen argon ambient atmosphere, 20.0g (40.6mmol) 2 and 7-dibromo -9, a 9'-G n-hexyl fluorene, 13.3g (89.4mmol) 4-vinyl phenyl borate [H₂C=CHC₆H₄B(OH)₂] and 0.46g (0.4mmol) tetrakis(triphenyl) phosphinepalladium are put in, and it dissolves in 200ml toluene — making — further — 2M — The 100ml sodium-carbonate solution was added and it was made to flow back for 48 hours. Subsequently, after the mixed solvent of ethyl acetate/hexane (1:3) refined the liquid with the viscosity which removed and obtained the solvent after having rinsed the extract several times, having made it dry with a magnesium sulfate anhydride after it reduced temperature to the room temperature after the completion of a reaction and toluene extracted 3 times, and filtering using the silica gel column, it was made to recrystallize with the mixed solvent of ethyl acetate/hexane, and the yellow crystal was obtained. Subsequently, the obtained crystal was fully dried in 40-degree C vacuum oven, and the 16.0g (73% of yield) product was obtained. The melting point was 106–107 degrees C.

1 H-NMR (CDCl₃), delta 0.75–1.16 (m, 22H, CH₂ and CH₃), 2.04–2.12 (m, 4H, CCH₂), 5.29–6.86 (m, 6H, vinyl), 7.53–7.82 (m, 14H, aromatic series) [0075] Example 92, the 7-screw (3-chloro methylphenyl) -9, the synthetic agitator of a 9'-G n-hexyl fluorene (M-9), In the three-lot flask of 250ml ** equipped with the thermometer and the reflux capacitor The bottom of an argon ambient atmosphere, the 2.0g (4.7mmol) 9 and 9'-G n-hexyl fluorene -2, 7-JIBORETO, 2.14g (10.4mmol) 3-BUROMO benzyl chloride (BrC₆H₄CH₂Cl) and 0.12g (0.104mmol) tetrakis(triphenyl) phosphinepalladium are put in, and it dissolves in 50ml toluene — making — further — 2M — The 25ml sodium-carbonate solution was added and it was made to flow back for 48 hours. After the mixed solvent of ethyl acetate/hexane (1:3) refined the liquid with the viscosity which removed and obtained the solvent after having rinsed the extract several times, having made it dry with a magnesium sulfate anhydride after the reaction was completed, it reduced temperature to the room temperature and toluene extracted 3 times, and filtering using the silica gel column, it was made to recrystallize with the mixed solvent of ethyl acetate/hexane, and the cream-colored crystal was obtained. Subsequently, the obtained crystal was fully dried in 40-degree C vacuum oven, and the 1.2g (43.5% of yield) product was obtained. The melting point was 97–98 degrees C.

1 H-NMR (CDCl₃), delta 0.75–1.11 (m, 22H, CH₂ and CH₃) and 2.05–2.13 (m, 4H, CCH₂), 4.73 (s, 4H, CH₂Cl), and 7.41–7.84 (m, 14H, aromatic series) [0076] Example 102, the 7-screw (tolyl) -9, the synthetic mechanical agitation machine of a 9'-G n-hexyl fluorene (M-10), In the three-lot flask of 1 liter capacity equipped with the thermometer and the reflux capacitor The bottom of nitrogen-gas-atmosphere mind, 40.0g (81.3mmol) 2 and 7-dibromo -9, a 9'-G n-hexyl fluorene, Put in 24.4g (0.18mmol) 4-tolyl borate [CH₃C₆H₄B(OH)₂] and 0.94g (0.81mmol) tetrakis(triphenyl phosphine)palladium, and it is made to dissolve in 400ml toluene. Furthermore, the sodium-carbonate solution (2M and 200ml) was added, and it was made to flow back for 48 hours. After the mixed solvent of ethyl acetate/hexane (1:2) refined the liquid with the viscosity which removed and obtained the solvent after having rinsed the extract several times, having made it dry with a magnesium sulfate anhydride after the reaction was completed, it reduced temperature to the room temperature and toluene extracted 3 times, and filtering using the silica gel column, it was made to recrystallize with the mixed solvent of ethyl acetate/hexane, and the cream-colored crystal was obtained. Subsequently, the obtained crystal was fully dried in 40-degree C vacuum oven, and the 36.1g (86% of yield) product was obtained. The melting point was 88–89 degrees C.

1 H-NMR (CDCl₃), delta 0.76–1.10 (m, 22H, CH₂ and CH₃) and 2.03–2.11 (m, 4H, CCH₂), 2.46 (s, 6H, CH₃), and 7.31–7.82 (m, 14H, aromatic series) [0077] It was made to flow back, after putting 15.0g (29.1mmol) 2 and the 7-screw (tolyl) -9, and the 9'-G n-hexyl fluorene into the three-lot flask of 1 liter capacity equipped with Example 112, the 7-screw (4-carboxyl phenyl) -9, the synthetic agitator of a 9'-G n-hexyl fluorene (M-11), the thermometer, and the reflux capacitor and dissolving a 270ml pyridine in it. Subsequently, the 50ml boiling water was added to said solution, after adding having applied 13.8g (87.4mmol) potassium permanganate in 4 hours, it was made to flow back for 8 hours, and brown mixed liquor was obtained. Subsequently, the 350ml boiling water was added to said mixed liquor, further, after adding having applied 27.6g potassium permanganate in 6 hours, it was made to flow back for 12 hours, and brown mixed liquor was obtained. Subsequently, said mixed liquor was filtered in the hot condition, the boiling water washed several times, and the yellow solution was obtained. Subsequently, when concentrated hydrochloric acid was added small quantity every in said solution and white sediment was generated, after filtering and washing in cold water thoroughly, it was made to fully dry in 50-degree C vacuum oven, and the solid-state with a white of 11.7g (70% of yield) was obtained. The melting point was 290–293 degrees C.

1 H-NMR (DMSO-d₆), delta 0.53–0.96 (m, 22H, CH₂ and CH₃), 0.96–2.11 (m, 4H, CCH₂), 7.71–8.05 (m, 14H, aromatic series), 12.96 (br, s, 2H, COOH) [0078] Example 122, the 7-screw (4-chloro carbonyl phenyl) -9, the synthetic agitator of a 9'-G n-hexyl fluorene (M-12), In the three-lot flask of 50ml ** equipped with the thermometer and the reflux capacitor 6.0g (10.4mmol) 2 and the 7-screw (carboxyl phenyl) -9, and a 9'-G n-hexyl fluorene are put in under an argon ambient atmosphere. After adding the 30ml thionyl chloride (SOCl₂) and making it dissolve with heating, 1ml dimethylformamide (DMF) was added and it was made to flow back for 12 hours. Subsequently, after reducing said solution in ordinary temperature and removing a solvent completely under reduced pressure, it was made to separate into the part which adds diethylether and is dissolved, and the part which is not dissolved. Subsequently, after removing diethylether from the part dissolved in said diethylether completely, it was made to recrystallize with the mixed solvent of the petroleum ether/diethylether, and the yellow crystal was obtained. Subsequently, filtered the obtained crystal, it was made to fully dry in 40-degree C vacuum oven, and the 4.3g (67% of yield) product was obtained. The melting point was 130–131 degrees C.

1 H-NMR (CDCl₃), delta 0.71–1.12 (m, 22H, CH₂ and CH₃), 2.03–2.11 (m, 4H, CCH₂), 7.61–8.25 (m, 14H, aromatic series) [0079] Example 132, the 7-screw (3-ethyloxy carbonyl phenyl) -9, the synthetic agitator of a 9'-G n-hexyl fluorene (M-13), In the three-lot flask of 500ml ** equipped with the thermometer and the reflux capacitor The bottom of an argon ambient atmosphere, the 10.0g (23.7mmol) 9 and 9'-G n-hexyl fluorene -2, 7-JIBORETO, Put in a 11.9g (52.1mmol) ethyl-3-bromobenzo art and 0.6g (0.52mmol) tetrakis(triphenyl phosphine)palladium, and it is made to dissolve in 260ml toluene. Furthermore, the sodium-carbonate solution (2M and 130ml) was added, and it was made to flow back for 48 hours. After the mixed solvent of ethyl acetate/hexane (1:3) refined the liquid with the viscosity which removed and obtained the solvent after having rinsed the extract several times, having made it dry with a magnesium sulfate anhydride after the reaction was completed, it reduced temperature to the room temperature and toluene extracted 3 times, and filtering using the silica gel column, it was made to recrystallize with the mixed solvent of ethanol/acetone, and the white crystal was obtained. Subsequently, the obtained crystal was fully dried in 40-degree C vacuum oven, and the 11g (73.8% of yield) product was obtained. The melting point was 94–95 degrees C.

1 H-NMR (CDCl₃), delta 0.70–1.06 (m, 22H, CH₂ and CH₃), 1.39–1.46 (t, 6H, CH₃), 2.00–2.08 (m, 4H, CCH₂), 4.37–4.48 (q, 4H, OCH₂), 7.50–8.35 (m, 14H, aromatic series) [0080] Example 142, the 7-screw (4-ethyloxy carbonyl phenyl) -9, the synthetic agitator of a 9'-G n-hexyl fluorene (M-14), In the three-lot flask of 500ml ** equipped with the thermometer and the reflux capacitor The bottom of an argon ambient atmosphere, the 10.0g (23.7mmol) 9 and 9'-G n-hexyl fluorene -2, 7-JIBORETO, Put in a 11.9g (52.1mmol) ethyl-4-bromobenzo art and 0.6g (0.52mmol) tetrakis(triphenyl phosphine)palladium, and it is made to dissolve in 260ml toluene. Furthermore, the sodium-carbonate solution (2M and 130ml) was added, and it was made to flow back for 48 hours. After the mixed solvent of ethyl acetate/hexane (1:3) refined the liquid with the viscosity which removed and obtained the solvent after having rinsed the extract several times, having made it dry with a magnesium sulfate anhydride after the reaction was completed, it reduced temperature to the room temperature and toluene extracted 3 times, and filtering using the silica gel column, it was made to recrystallize with the mixed solvent of ethanol/acetone, and the yellow crystal was obtained. Subsequently, the obtained crystal was fully dried in 40-degree C vacuum oven, and the 9g (60% of yield) product was obtained. The melting point was 100 degrees C.

1 H-NMR (CDCl₃), delta 0.72–1.05 (m, 22H, CH₂ and CH₃), 1.40–1.44 (t, 6H, CH₃), 2.00–2.08 (m, 4H, CCH₂), 4.38–4.45 (q, 4H, OCH₂), 7.58–8.14 (m, 14H, aromatic series) [0081] Example 151, the 4-screw (3-nitrophenyl) -3, the synthetic agitator of 6-G hexyloxy benzene (M-15), In the three-lot flask of 500ml ** equipped with the thermometer and the reflux capacitor The bottom of an argon ambient atmosphere, 20.0g (45.8mmol) 1 and 4-dibromo -3, 6-G hexyloxy benzene, Put in 16.8g (0.1 mols) 3-nitrobenzene borate (O₂NC₆H₄B (OH) 2) and 0.53g (0.46mmol) tetrakis(triphenyl phosphine)palladium, and it is made to dissolve in 200ml toluene. Furthermore, the sodium-carbonate solution (2M and 100ml) was added, and it was made to flow back for 48 hours. After the mixed solvent of ethyl acetate/hexane (1:3) refined the liquid with the viscosity which removed and obtained the solvent after having rinsed the extract several times, having made it dry with a magnesium sulfate anhydride after the reaction was completed, it reduced temperature to the room temperature and toluene extracted 3 times, and filtering using the silica gel column, it was made to recrystallize with the mixed solvent of ethyl acetate/hexane, and the detailed yellow crystal was obtained. Subsequently, the obtained crystal was fully dried in 40-degree C vacuum oven, and the 12g (50% of yield) product was obtained. The melting point was 126–127 degrees C.

1 H-NMR (CDCl₃), delta 0.87–1.77 (m, 22H, CH₂ and CH₃), 3.91–3.98 (m, 4H, OCH₂), 7.01–8.51 (m, 10H, aromatic series) [0082] In the two-lot flask of 500ml ** equipped with the synthetic agitator of Example 161, the 4-screw (3-aminophenyl) -3, and 6-G hexyloxy benzene (M-16) It was made to react in ordinary temperature for 24 hours, after putting in 9.0g (17.3mmol) 1 and the 4-screw (nitrophenyl) -3, 6-G hexyloxy benzene, and 10wt(s)% activated carbon support palladium (Pd/C) 2g and making it dissolve in 200ml THF, making it filled up with hydrogen gas. After the reaction was completed, and making it dry with a magnesium sulfate anhydride and filtering, the liquid with the viscosity which removed and obtained the solvent was made to recrystallize with the mixed solution of diethylether/methanol, and the white crystal was obtained. Subsequently, the obtained crystal was fully dried in 40-degree C vacuum oven, and the 7.0g (88% of yield) product was obtained. The melting point was 105–106 degrees C. 1 H-NMR (CDCl₃), delta 0.81–1.69 (m, 22H, CH₂ and CH₃), 3.57 (Br, s, 4H, NH₂), 3.83–3.89 (m, 4H, OCH₂), 6.62–7.24 (m, 10H, aromatic series) [0083] Example 172, the 7-screw (4-BUROMO phenyl) -9, the synthetic agitator of a 9-G n-hexyl fluorene (M-17), In the three-lot flask of 1 liter capacity equipped with the thermometer and the reflux capacitor After putting in 50.0g (0.1 mols) 2 and 7-diphenyl -9, and a 9'-G n-hexyl fluorene and making it dissolve in a 400ml methylene chloride, When -5 degrees C is made to cool using iced water, it adds at a time further one drop of 33.6g (0.21 mols) bromine diluted with the 100ml methylene chloride and addition was completed, temperature was made into 25 degrees C and it was made to react for 24 hours. After dissolving a liquid with the viscosity which removed and obtained the solvent after having rinsed several times, having made it dry with a magnesium sulfate anhydride after the reaction was completed, and adding gradually 20% of potassium-hydroxide water solution and separating an organic layer until red reaction mixture was exhausted, and filtering in a hexane, -40 degrees C was made to cool and the solid-state was obtained. Subsequently, after having made said solid-state recrystallize twice by the hexane, obtaining the crystal of a snow-white color and filtering the obtained crystal, it was made to fully dry in 30-degree C vacuum oven, and the 55g (83.66% of yield) product was obtained. The melting point was 121–123 degrees C.

1 H-NMR (CDCl₃), delta 0.71–1.06 (m, 22H, CH₂, CH₃), 1.99–2.06 (m, 4H, CCH₂), 7.45–7.78 (m, 16H, aromatic series) [0084] In the 250ml flask equipped with the synthetic agitator and thermometer of Example 182, the 7-screw (4-ethynyl phenyl) -9, and a 9'-G n-hexyl fluorene (M-18) After putting in a 4.0g (5.8mmol) 2, 7-screw [4-(trimethylsilyl) (ethynyl) phenyl]-9, and 9'-G n-hexyl fluorene and 6ml of 20wt(s)% potassium fluorides and making it dissolve in a 100ml methanol, it was made to react in ordinary temperature for 6 hours. After a reaction is completed, and adding a 50ml methanol, making it a vacuum and removing a solvent, The ether extracts 3 times, rinse several times, and it is made to dry with a magnesium sulfate anhydride. After making the solvent into the vacuum and removing it, after filtering, and the mixed solvent of a hexane/methylene chloride (4:1) refining using the silica gel column, removed the solvent, it was made to recrystallize by the hexane, and the solid-state with a light yellow of 2.8g (90% of yield) was obtained. The melting point was 101–102 degrees C.

1 H-NMR (CDCl₃), delta 0.78–1.42 (m, 22H, CH₂, CH₃), 2.02–2.1 (m, 4H, CCH₂), 3.19 (s, 2H, CH), 7.42–7.78 (m, 14H, aromatic series) [0085] Example 192, the 7-screw (4-aldehyde phenyloxy phenyl) -9, the synthetic agitator of a 9'-G n-hexyl fluorene (M-19), In the three-lot flask of 100ml ** equipped with the thermometer and the reflux capacitor The bottom of an argon ambient atmosphere, 4.0g (7.7mmol) 2 and the 7-screw (4-hydroxyphenyl) -9, a 9'-G n-hexyl fluorene, After putting in 1.96g (15.8mmol) 4-fluoro benzaldehyde and 2.13g (15.4mmol) potassium carbonate and making it dissolve in 25ml dimethylacetamide (DMAc), it was made to flow back at 120 degrees C for 8 hours. When reduced temperature in ordinary temperature and said solution was made gradually dropped at 400ml water, after the reaction was completed, and the solid-state deposited, after having filtered, dissolving said solid-state in diethylether further and washing in cold water several times, made it dry with a magnesium sulfate anhydride, filtered, removed the solvent, it was made to recrystallize with the mixed solvent of ethyl acetate/hexane, and the white solid-state was obtained. Subsequently, the obtained solid-state was fully dried in 40-degree C vacuum oven, and the 4.3g (76.7% of yield) product was obtained. The melting point was 86–88 degrees C.

1 H-NMR (CDCl₃), delta 0.73–1.09 (m, 22H, CH₂ and CH₃), 2.03–2.10 (m, 4H, CCH₂), 7.13–7.91 (m, 22H, aromatic series), 9.95 (s, 2H, CHO) [0086] Example 202, the 7-screw (4-nitrophenyloxy phenyl) -9, the synthetic agitator of a 9'-G n-hexyl fluorene (M-20), In the three-lot flask of 100ml ** equipped with the thermometer and the reflux capacitor The bottom of an argon ambient atmosphere, 6.0g (11.6mmol) 2 and the 7-screw (4-hydroxyphenyl) -9, a 9'-G n-hexyl fluorene, After putting in a 3.3g (23.7mmol) 1-fluoro-4-nitrobenzene and 3.2g (23.1mmol) potassium

carbonate and making it dissolve in 35ml dimethylacetamide, it was made to flow back at 120 degrees C for 8 hours. When reduced temperature in ordinary temperature and said solution was made gradually dropped at 400ml water, after the reaction was completed, and the solid-state deposited, after having filtered, dissolving said solid-state in diethylether further and washing in cold water several times, made it dry with a magnesium sulfate anhydride, filtered, removed the solvent, it was made to recrystallize with the mixed solvent of ethyl acetate/hexane, and the solid-state of light yellow was obtained. Subsequently, the obtained solid-state was fully dried in 40-degree C vacuum oven, and the 7.2g (79.8% of yield) product was obtained. The melting point was 102-103 degrees C.

1 H-NMR (CDCl₃), delta 0.73-1.09 (m, 22H, CH₂ and CH₃), 2.03-2.11 (m, 4H, CCH₂), 7.06-8.28 (m, 22H, aromatic series) [0087] In the two-lot flask of 500ml ** equipped with Example 212, the 7-screw (4-aminophenyl oxy-phenyl) -9, and the synthetic agitator of a 9'-G n-hexyl fluorene (M-21) After putting in 6.0g (7.9mmol) 2 and the 7-screw (4-nitrophenoxy phenyl) -9, a 9'-G n-hexyl fluorene, and 10wt(s)% activated carbon support palladium (Pd/C) 2g and making it dissolve in 200ml THF, It was made to react in ordinary temperature for 24 hours, making it filled up with hydrogen gas. After the reaction was completed, made it dry with a magnesium sulfate anhydride, filtered, the liquid with the viscosity which removed and obtained the solvent was made to recrystallize with the mixed solvent of ethyl acetate/hexane, and the yellow crystal was obtained. Subsequently, the obtained crystal was fully dried in 40-degree C vacuum oven, and the 4.7g (85% of yield) product was obtained. The melting point was 57-58 degrees C.

1 H-NMR (CDCl₃), delta 0.71-1.05 (m, 22H, CH₂ and CH₃), 2.01-2.05 (m, 4H, CCH₂), 6.68-7.75 (m, 22H, aromatic series) [0088] Example 222, the 7-screw (3-carboxyl phenyl) -9, the synthetic agitator of a 9'-G n-hexyl fluorene (M-22), In the three-lot flask of 500ml ** equipped with the thermometer and the reflux capacitor Put in 15.0g (23.8mmol) 2 and the 7-screw (3-ethyloxy carbonyl phenyl) -9, and a 9'-G n-hexyl fluorene, and it is made to dissolve in 100ml THF under an argon ambient atmosphere. Furthermore, 100ml of lithium-hydroxide (LiOH) water solutions of 1M was added, and it was made to flow back for 5 hours. After the reaction was completed, THF was removed, and it agitated, adding concentrated hydrochloric acid gradually, and the solid-state was obtained. Subsequently, after filtering said solid-state and washing in cold water thoroughly, put in the hexane further, it was made to agitate for 2 hours, and the cream-colored solid-state was obtained. Subsequently, the obtained solid-state was fully dried in 40-degree C vacuum oven, and the 13.1g (95% of yield) product was obtained. The melting point was 227-229 degrees C.

1 H-NMR (DMSO-d₆), delta 0.58-0.92 (m, 22H, CH₂ and CH₃), 2.05-2.09 (m, 4H, CCH₂), 7.5-8.28 (m, 14H, aromatic series) [0089] Example 232, the 7-screw (3-chloro carbonyl phenyl) -9, the synthetic agitator of a 9'-G n-hexyl fluorene (M-23), In the three-lot flask of 50ml ** equipped with the thermometer and the reflux capacitor After putting in, heating and dissolving 8.0g (13.9mmol) 2 and the 7-screw (3-carboxyl phenyl) -9, a 9'-G n-hexyl fluorene, and a 40ml thionyl chloride, 2ml DMF was added and it was made to flow back under an argon ambient atmosphere for 24 hours. After the reaction was completed, and reducing the temperature of said solution in ordinary temperature, the solvent was completely removed under reduced pressure and what adds a cyclohexane and is dissolved, and the thing which is not dissolved were separated. Subsequently, after removing a solvent to said thing dissolved, made it dissolve in a hexane further, it was made to recrystallize, and the yellow crystal was obtained. Subsequently, filtered said crystal, it was made to fully dry in 40-degree C vacuum oven, and the 6.0g (70% of yield) product was obtained. The melting point was 113-114 degrees C.

1 H-NMR (CDCl₃), delta 0.72-1.13 (m, 22H, CH₂ and CH₃), 2.04-2.11 (m, 4H, CCH₂), 7.26-8.41 (m, 14H, aromatic series) [0090] the three-lot flask of 250ml ** equipped with Example 242, the 7-screw (4-hydroxy methylphenyl) -9, the synthetic dropping wax of a 9'-G n-hexyl fluorene (M-24), and an agitator and a reflux capacitor — the bottom of an argon ambient atmosphere, 6.0g (9.5mmol) 2 and the 7-screw (4-ethyloxy carbonyl phenyl) -9, and a 9'-G n-hexyl fluorene — putting in — anhydrous [30ml] — it was made to dissolve in THF moreover, anhydrous [40ml] — after having prepared the ice bath after having made said reactant add quickly using a dropping wax after manufacturing LiAlH₄ solution of 1M to THF, and making this mixture flow back for 24 hours, and making water dropped gradually — further — 16wt(s)% NaOH was dropped. Subsequently, after it filters precipitate and chloroform washes, chloroform and water extract a solution. Subsequently, after making it dry with a magnesium sulfate anhydride, filtering and decompressing the extracted organic solution and chloroform's removing, it was made to recrystallize with the mixed solvent of ethyl acetate/hexane, and the white solid-state was obtained. Subsequently, filtered said solid-state, it was made to fully dry in 40-degree C vacuum oven, and the 5.1g (96% of yield) product was obtained. The melting point was 113-114 degrees C.

1 H-NMR (CDCl₃), delta 0.73-1.07 (m, 22H, CH₂ and CH₃), 1.89 (s, 2H, OH), 2.01-2.09 (m, 4H, CCH₂), 4.78 (s, 4H, CH₂), 7.47-7.80 (m, 14H, aromatic series) [0091] Example 252, the 7-screw (4-chloro methylphenyl) -9, the synthetic agitator of a 9'-G n-hexyl fluorene (M-25), In the three-lot flask of 100ml ** equipped with the thermometer and the reflux capacitor After putting in 4.0g (7.31mmol) 2 and the 7-screw (4-hydroxy methylphenyl) -9, and the 9'-G n-hexyl fluorene and making it dissolve in a 50ml methylene chloride under an argon ambient atmosphere, After making the solution which added the 1.4ml thionyl chloride and the 0.05ml pyridine flow back for 12 hours and reducing temperature in ordinary temperature, said methylene chloride, the thionyl chloride, and the pyridine were removed under reduced pressure. Subsequently, after the mixed solvent of a hexane/ethyl acetate (5:1) refined the remaining solid-state using the silica gel column, it was made to recrystallize with the mixed solvent of chloroform/methanol, and the white crystal was obtained. Subsequently, filtered said crystal, it was made to fully dry in 40-degree C vacuum oven, and the 4.1g (94% of yield) product was obtained. The melting point was 104-105 degrees C.

1 H-NMR (CDCl₃), delta 0.73-1.13 (m, 22H, CH₂ and CH₃) and 2.00- 2.08 (m, 4H, CH₂), 4.68 (s, 4H, CH₂Cl), and

7.49–7.81 (m, 14H, aromatic series) [0092] Example 262, the 7-screw (4-hydrazide phenyl) –9, the synthetic agitator of a 9'-G n-hexyl fluorene (M-26), In the three-lot flask of 100ml ** equipped with the thermometer and the reflux capacitor Under the argon ambient atmosphere, after adding, heating and dissolving 5.0g (7.92mmol) 2 and the 7-screw (3-ethyloxy carbonyl phenyl) –9, a 9'-G n-hexyl fluorene, and 35ml butyl alcohol, a hydrazine and 1 6ml hydrate was dropped. Subsequently, after making it react at 80 degrees C for 48 hours, temperature was reduced in ordinary temperature and ethyl acetate and water extracted it. Subsequently, after drying an organic layer with a magnesium sulfate anhydride, only little ethyl acetate was left and removed. Subsequently, after dropping said little ethyl acetate at the hexane and settling it, washed for 1 hour, filtered the solid-state, it was made to fully dry in 40-degree C vacuum oven, and the 2.0g (42% of yield) product was obtained. The melting point was 134–136 degrees C. 1 H-NMR (CDCl3), delta0.72–1.19 (m, 22H, CH2 and CH3) and 2.03– 2.10 (m, 4H, CH2), 4.21 (br, s, 4H, NH2), 7.51 (s, 2H, NH), and 7.60–7.90 (m, 14H, aromatic series) [0093] Example 272, the 7-screw (3-hydrazide phenyl) –9, the synthetic agitator of a 9'-G n-hexyl fluorene (M-27), In the three-lot flask of 100ml ** equipped with the thermometer and the reflux capacitor Under the argon ambient atmosphere, after adding, heating and dissolving 5.0g (7.92mmol) 2 and the 7-screw (3-ethyloxy carbonyl phenyl) –9, a 9'-G n-hexyl fluorene, and 35ml butyl alcohol, a hydrazine and 1 6ml hydrate was dropped. Subsequently, after making it react at 80 degrees C for 48 hours, temperature was reduced in ordinary temperature and ethyl acetate and water extracted it. Subsequently, after drying the extracted organic layer with a magnesium sulfate anhydride, only little ethyl acetate was left and removed. Subsequently, after dropping said little ethyl acetate at the hexane and settling it, washed for 1 hour, filtered the solid-state, it was made to fully dry in 40-degree C vacuum oven, and the 2.5g (52.4% of yield) product was obtained. The melting point was 106–108 degrees C.

1 H-NMR (CDCl3), delta0.72–1.06 (m, 22H, CH2 and CH3) and 2.03– 2.10 (m, 4H, CH2), 4.21 (br, s, 4H, NH2), 8.09 (s, 2H, NH), and 7.60–7.90 (m, 14H, aromatic series) [0094] To the round bottom flask equipped with the synthetic agitator and capacitor of Example 282, the 7-screw (4-methoxyphenyl) –9, and a 9'-G n-hexyl fluorene (M-28) The bottom of an argon ambient atmosphere, a 45.1g (81.4mmol) 2, 7-(dibromo)–9, and 9'-G n-hexyl fluorene, Put in 32.0g (0.21 mols) p-methoxyphenyl borate and 1.06g (1mmol) tetrakis triphenyl HOSUFINIUMU palladium (O), and it is made to dissolve in 600ml toluene. Furthermore, the potassium carbonate water solution (2M and 400ml) was added, and it was made to flow back at the temperature of 120 degrees C for 48 hours. After collected only organic layers, having washed in cold water several times, after toluene extracted the reactant several times, the magnesium sulfate anhydride's having removed moisture, filtering, removing a solvent and refining using a column using ethyl acetate as an expansion solvent, it was made to recrystallize as a solvent using ethyl acetate/hexane, and the 41.5g (83% of yield) product was obtained. The melting point was 104–105 degrees C.

1 H-NMR (CDCl3), delta0.76–1.16 (m, 22H, CH2, CH3), 2.10– (m, 4H, CCH2), 3.91 (s, 6H, OCH3), 7.03–7.75 (m, 14H, aromatic series) [0095] To Example 292, the 7-screw (4-hydroxyphenyl) –9, and the synthetic round bottom flask of a 9'-G n-hexyl fluorene (M-29) After putting in 30.0g (54.9mmol) 2 and the 7-screw (4-methoxyphenyl) –9, and the 9'-G n-hexyl fluorene and making it dissolve in a 400ml methylene chloride, – It is made to react at said temperature for 1 hour, and it was made to react for 24 hours, after being gradually dropped with the reaction temperature of 70 degrees C, boric-acid covering [1M and 220ml] it in 1 hour, raising temperature in ordinary temperature.

Subsequently, the organic layer was made to separate after hydrolyzing by adding water to said reactant. Subsequently, if a 2-N sodium-hydroxide water solution is added in said organic layer and the solid-state of an alkali condition deposits The ether extracts and only organic layers are collected, after adding a thin hydrochloric acid, making it neutralize and dissolving in transparency. Distilled water washes several times and a magnesium sulfate anhydride is made to remove moisture. After removing a solvent and ethyl acetate/hexane (1:10) refined, using a column as an expansion solvent, it was made to recrystallize as a solvent using the ether, and the 21.8g (76.6% of yield) product was obtained. The measured melting point was 142–143 degrees C.

1 H-NMR (DMSO-d6), delta0.61–1.16 (m, 22H, and –CH2–, –CH3), 2.10–2.12 (m, 4H, and –CCH2–), 6.89–7.85 (m, 14H, aromatic series), 9.57 (s, 2H, –OH) [0096] To Example 302, the 7-screw (4-SHIANATO phenyl) –9, and the synthetic round bottom flask of a 9'-G n-hexyl fluorene (M-30) 10.0g (19.3mmol) 2 and the 7-screw (4-hydroxyphenyl) –9, a 9'-G n-hexyl fluorene, and 6.1g (57.9mmol) cyano bromide are added under an argon ambient atmosphere. Make a 100ml acetone agitate and it was made to dissolve, and after making it dropped in 30 minutes at the temperature of –30 degrees C, having applied 8ml triethylamine, the reaction was performed for 10 hours, raising temperature in ordinary temperature. Subsequently, after having made it dry with a magnesium sulfate anhydride, having filtered, after making the methylene chloride extract and collecting organic layers, after adding 500ml water to said reactant and interrupting a reaction (quanching), and distilled water's washing several times, and removing a solvent, it was made to recrystallize with ethyl acetate and the 8.7g (79.4% of yield) product was obtained. The melting point was 125–126 degrees C.

1 H-NMR (CDCl3), delta0.74–1.08 (m, 22H, and –CH2–, –CH3–), 2.03–2.07 (m, 4H, and –CCH2–), 7.40–7.84 (m, 14H, aromatic series) [0097] To the round bottom flask equipped with the synthetic Dean Stark (Dean Stark) equipment of an Example 312, 7-screw [4–(3, 4-dicyano phenoxy) phenyl]–9, and 9'-G n-hexyl fluorene (M-31) 10.0g (19.3mmol) 2 and the 7-screw (4-hydroxyphenyl) –9, and a 9'-G n-hexyl fluorene are put in. It was made to flow back, after making it dissolve in 50ml DMF and 40ml toluene, adding 5.6 moreg (40.5mmol) potassium carbonate, and maintaining the temperature of about 140 degrees C. Subsequently, after removing water and toluene from said Dean Stark completely, about 60 degrees C is made to cool temperature, it added to the reaction mixture and 6.93g (40.5mmol) p-nitro phthalonitrile was made to react to it for 24 hours. Subsequently, after settling said reactant in 1000ml water, filtered sediment, carried out reduced pressure drying at 60 degrees C, a hexane/ethyl acetate (4:1)

refined, using a column as an expansion solvent, it was made to recrystallize with ethyl acetate, and the 10.2g (69% of yield) product was obtained. The melting point was 183–184 degrees C.

1 H-NMR (CDCl₃), delta 0.68–0.81 (m, 22H, and –CH₂–, –CH₃), 2.06–2.08 (m, 4H, and –CCH₂–), 7.14–7.80 (m, 20H, aromatic series) [0098] To the synthetic round bottom flask of an Example 322, 7-screw [4-(3, 4-dicarboxy phenoxy) phenyl]–9, and 9'-G n-hexyl fluorene (M-32) 10.0g (13mmol) 2, 7-screw [4-(3, 4-dicyano phenoxy)–phenyl]–9, and 9'-G n-hexyl fluorene, It was made to flow back for three days, putting in and agitating a 14.6g (0.26mmol) potassium hydroxide, 75ml distilled water, and 75ml ethanol. Subsequently, after removing the impurity which is not dissolved by filtering a hot reactant, the hydrochloric acid was added, after filtering the solid-state which adjusted pH to 2–3 and was obtained and washing in cold water several times, neutralize, carried out reduced pressure drying at 60 degrees C for 24 hours, it was made to recrystallize by ethyl acetate and n-hexane, and the product with a white of 8.6g (78.3% of yield) was obtained. The melting point was 214–215 degrees C.

1 H-NMR (DMSO-d₆), delta 0.58–1.20 (m, 22H, CH₂, CH₃), 2.16–2.20 (m, 4H, CCH₂), 7.16–7.92 (m, 20H, aromatic series) [0099] The 5.0g (5.9mmol) 2, 7-screw [4-(3, 4-dicarboxy phenoxy) phenyl]–9, and 9'-G n-hexyl fluorene and the 50ml acetic anhydride were put into the synthetic round bottom flask of an Example 332, 7-screw [4-(3, 4-dicarboxy phenoxy) phenyl]–9, and 9'-G n-hexyl full orange anhydride (M-33), and it was made to flow back for 24 hours. After removing the impurity which is not dissolved by filtering a hot solution, it was made to cool gradually and the 3.75g (78% of yield) product was obtained. The measured melting point was 187–188 degrees C.

1 H-NMR (CDCl₃), delta 0.76–1.12 (m, 22H, CH₂, CH₃), 2.13–2.15 (m, 4H, CCH₂), 7.24–8.04 (m, 20H, aromatic series) [0100] To the 1l. round bottom flask equipped with the synthetic capacitor and dropping wax of Example 342, the 7-screw (4-acetyl phenyl) –9, and a 9'-G n-hexyl fluorene (M-34) 30.0g (61.6mmol) 2 and the 7-screw (diphenyl) –9, a 9'-G n-hexyl fluorene, and 500ml carbon disulfide are put in. After agitating in ordinary temperature and making it dissolve completely, 24.66g (185mmol) 3 aluminum chlorides are added at 0 degree C, and after making it dropped in 1 hour using a dropping wax, applying a 14.5g (185mmol) acetyl chloride, it was made to flow back for 24 hours. Subsequently, after filling the mixture of the hydrochloric acid of 2M, and iced water with said reactant and interrupting a reaction, After making a methylene chloride extract, collecting organic layers and washing in cold water several times, a magnesium sulfate anhydride is made to remove moisture. After filtering, removing a solvent and the methylene chloride/hexane (1/10) refined, using a column as an expansion solvent, it was made to recrystallize by the methylene chloride/hexane, and the 23.5g (66.8% of yield) product was obtained. The measured melting point was 130–131 degrees C.

1 H-NMR (CDCl₃), delta 0.73–0.79 (m, 22H, CH₂, CH₃), 2.07 (m, 4H, CCH₂), 2.68 (s, 6H, COCH₃), 7.63–8.12 (m, 14H, aromatic series) [0101] After putting 10.0g (15.5mmol) 2 and the 7-screw (4-BUOMO phenyl) –9, the 9'-G n-hexyl fluorene, and the 4.2g (46.5mmol) copper cyanide into the round bottom flask equipped with Example 352, the 7-screw (4-cyanophenyl) –9, and the synthetic capacitor of a 9'-G n-hexyl fluorene (M-35) and dissolving 60ml DMF in it, reflux was performed for 48 hours, agitating. Subsequently, after filling 1l. of 15% of aqueous ammonia solutions with the reactant and making precipitate generate, Filter, and after it collects precipitate and 15% of aqueous ammonia solution, 10% of aqueous ammonia solution, and distilled water fully wash, carry out reduced pressure drying at 60 degrees C, make moisture remove completely, make it dissolve in a hot acetone, and it filters. After removing the impurity which is not dissolved and ethyl acetate/hexane (1:1) refined, using a column as an expansion solvent, it was made to recrystallize using ethyl acetate/hexane, and the 6.6g (79.4% of yield) product was obtained. The measured melting point was 113–115 degrees C.

1 H-NMR (CDCl₃), delta 0.71–1.58 (m, 22H, CH₂, CH₃), 2.01–2.08 (m, 4H, CCH₂), 7.56–7.85 (m, 14H, aromatic series) [0102] Example 362, the 7-screw (p-hydroxy styryl) –9, the synthetic agitator of a 9'-G n-hexyl fluorene (M-36), In the three-lot flask of 500ml ** equipped with the thermometer and the reflux capacitor After putting in 32.7g (0.05 mols) 2 and the 7-screw (p-acetoxy styryl) –9, a 9'-G n-hexyl fluorene, and 28.0g (0.5 mols) KOH and making it dissolve in a 200ml methanol, it was made to flow back under nitrogen-gas-atmosphere mind for 12 hours. Subsequently, reaction temperature was reduced in ordinary temperature, said reaction mixture was gradually dropped at 2.0l. 2.0-N hydrochloric-acid water solution, and the solid-state was deposited. Subsequently, after filtering and washing said solid-state which deposited in cold water and adding toluene further, it distilled and water and toluene were removed. Subsequently, the generated solid-state was made to recrystallize twice by toluene, and 27.1g (95% of yield) of solid-states of pure yellow was obtained. The melting point was 96–97 degrees C.

1 H-NMR (CDCl₃), delta 0.56–1.15 (m, 22H, CH₂ and CH₃), 2.00 (br, 4H, CH₂), 5.10 (br, s, 2H, OH), 6.82–6.86 (d, 4H, vinyl), 7.08–7.64 (m, 14H, aromatic series) [0103] The synthetic agitator of an Example 372, 7-screw [4-(3, 4-dicarboxy phenoxy) phenylene vinyl]–9, and 9'-G n-hexyl full orange anhydride (M-37), In the three-lot flask of 250ml ** equipped with the thermometer and the reflux capacitor The 3.0g (3.3mmol) 2, 7-screw [4-(3, 4-dicarboxy phenoxy) phenylene vinyl]–9, and 9'-G n-hexyl fluorene, the 15ml acetic anhydride, and the 15ml acetic acid were put in, and it was made to flow back for 24 hours. Subsequently, after removing the impurity which is not dissolved by filtering hot reaction mixture, it was made to cool gradually and the 1.9g (67% of yield) solid-state was obtained. The melting point was 190–193 degrees C.

1 H-NMR (CDCl₃), delta 0.71–1.25 (m, 22H, CH₂ and CH₃), 2.00 (br, 4H, CH₂), 6.82–6.86 (d, 4H, vinyl), 7.09–7.65 (m, 20H, aromatic series) [0104] Example 382, the 7-screw (4-fluoro styryl) –9, the synthetic agitator of a 9'-G n-hexyl fluorene (M-38), In the three-lot flask of 250ml ** equipped with the thermometer and the reflux capacitor The bottom of an argon ambient atmosphere, 17.7g (36mmol) 2 and 7-dibromo –9, a 9'-G n-hexyl fluorene, and 10g (82mmol) 4-fluoro styrene, After putting in 0.113g palladium (II) acetate, a 1.13g tree o-tolyl phosphine, and 17ml tree n butylamine, 60ml DMF was added and it was made to react at 100 degrees C for 24 hours. Subsequently,

after having reduced the temperature of said reactant in ordinary temperature, and diethylether and water having extracted and drying an organic layer with a magnesium sulfate anhydride, removed completely under reduced pressure of diethylether, it was made to recrystallize with the mixed solvent of a hexane/ethyl acetate, and the yellow solid-state was obtained. Subsequently, filtered said solid-state, it was made to fully dry in 40-degree C vacuum oven, and the 1.1g (53% of yield) product was obtained. The melting point was 110-111 degrees C.

1 H-NMR (CDCl₃), delta 0.66-1.15 (m, 22H, CH₂ and CH₃), 1.95-2.00 (m, 4H, CH₂), 7.08-7.65 (m, 14H, aromatic series, 4H, vinyl) [0105] Example 392, the 7-screw (3-nitro styryl) -9, the synthetic agitator of a 9'-G n-hexyl fluorene (M-39), In the three-lot flask of 250ml ** equipped with the thermometer and the reflux capacitor The bottom of an argon ambient atmosphere, 33.0g (67mmol) 2 and 7-dibromo -9, a 9'-G n-hexyl fluorene, and 25g (168mmol) 3-nitro styrene, After putting in 0.151g palladium (II) acetate, a 1.232g tree o-tolyl phosphine, and 15.2g triethylamine, 100ml DMF was added and it was made to react at 100 degrees C for 24 hours. Subsequently, after reduced the temperature of said reactant in ordinary temperature, said reactant was dropped at 1l. of methanols containing a small amount of hydrochloric acid, depositing the solid-state, filtering this solid-state and a methanol's washing, it was made to fully dry in 40-degree C vacuum oven, and the 31.5g (75% of yield) product was obtained. The melting point was 189-192 degrees C.

1 H-NMR (CDCl₃), delta 0.66-1.15 (m, 22H, CH₂ and CH₃), 1.95-2.00 (m, 4H, CH₂), 7.15-8.48 (m, 14H, aromatic series, 4H, vinyl) [0106] Example 402, the 7-screw (4-nitro styryl) -9, the synthetic agitator of a 9'-G n-hexyl fluorene (M-40), In the three-lot flask of 250ml ** equipped with the thermometer and the reflux capacitor The bottom of an argon ambient atmosphere, 33.0g (67mmol) 2 and 7-dibromo -9, a 9'-G n-hexyl fluorene, and 25g (168mmol) 4-nitro styrene, After putting in 0.151g palladium (II) acetate, a 1.232g tree o-tolyl phosphine, and 15.2g triethylamine, 100ml DMF was added and it was made to react at 100 degrees C for 24 hours. Subsequently, after reduced the temperature of said reactant in ordinary temperature, said reactant was dropped at 1l. of methanols containing a small amount of hydrochloric acid, depositing the solid-state, filtering this solid-state and a methanol's washing, it was made to fully dry in 40-degree C vacuum oven, and the 33g (78% of yield) product was obtained. The melting point was 164-166 degrees C.

1 H-NMR (CDCl₃), delta 0.66-1.15 (m, 22H, CH₂ and CH₃), 1.95-2.00 (m, 4H, CH₂), 7.15-7.81 (m, 14H, aromatic series, 4H, vinyl) [0107] The polymerization of the synthetic example 412 of a polymer, the 7-screw (4-aminophenyl) -9, a 9'-G n-hexyl fluorene (M-3), and an isophthal aldehyde (P-1, P-1-1, and P-1-2)

In 50ml flask equipped with the agitator under nitrogen-gas-atmosphere mind, 0.516g (1mmol) 2 and the 7-screw (4-aminophenyl) -9, a 9'-G n-hexyl fluorene, A 0.134g (1mmol) isophthal aldehyde, p-toluene sulfide and 1 3.0mg (0.016mmol) hydrate, and a 0.224g calcium chloride are put in. 3ml hexa methyl phosphoamides (HMPA) and 3ml dimethyl sulfoxide (DMSO) were added, and it was made to dissolve. Subsequently, after making said mixed solvent react in ordinary temperature for 24 hours, it was gradually dropped at the 1l. methanol, and the polymer was deposited. Subsequently, after filtering the polymer which deposited and making it dissolve in chloroform further, the polymer which the methanol was made to reprecipitate and was refined was obtained. Subsequently, after it filtered said obtained polymer and the methanol washed thoroughly, it was made to fully dry in 40-degree C vacuum oven, and the polymer with a yellow of 0.57g (92.8% of yield) was obtained.

1 H-NMR (CDCl₃), delta 0.76-1.1 (CH₂ and CH₃), 2.08 (br, s, CCH₂), 7.39-8.52 (m, aromatic series), 8.68 (s, ArCH=NAr).

[0108] After dissolving P-1 polymer in which photo luminescence is not shown in chloroform, when one drop of concentrated hydrochloric acid of an inorganic acid was added, the polymer (P-1-1) with which the acid was added was formed, and, as for this polymer, photo luminescence was shown. After dissolving P-1 polymer in chloroform by the same approach, when little dropping of the p-toluene sulfide of an organic acid was carried out, the polymer (P-1-2) with which the acid was added was formed, and this polymer also showed photo luminescence.

[0109] The polymerization of Example 422, the 7-screw (4-aminophenyl) -9, a 9'-G n-hexyl fluorene (M-3), and a 2, the 7-screw (4-aldehyde phenyl) -9 and a 9'-G n-hexyl fluorene (M-6) (P-2)

In 50ml flask equipped with the agitator under nitrogen-gas-atmosphere mind, 0.516g (1mmol) 2 and the 7-screw (4-aminophenyl) -9, a 9'-G n-hexyl fluorene, 0.542g (1mmol) 2 and the 7-screw (4-aldehyde phenyl) -9, a 9'-G n-hexyl fluorene, p-toluene sulfide and 1 0.003g (0.016mmol) hydrate and a 0.336g calcium chloride are put in, and 3ml HMPA and 3ml DMSO were added, and it was made to dissolve. Subsequently, after making said mixed solvent react in ordinary temperature for 24 hours, it was gradually dropped at the 1l. methanol, and the polymer was deposited. Subsequently, after filtering the polymer which deposited and making it dissolve in chloroform further, the polymer which the methanol was made to reprecipitate and was refined was obtained. Subsequently, after it filtered said obtained polymer and the methanol washed thoroughly, it was made to fully dry in 40-degree C vacuum oven, and the polymer with a yellow of 0.87g (85.3% of yield) was obtained.

1 H-NMR (CDCl₃), delta 0.79-1.1 (CH₂ and CH₃), 2.11 (br, s, CCH₂), 7.43-8.09 (m, aromatic series), 8.64 (s, ArCH=NAr).

[0110] The polymerization of Example 432, the 7-screw (4-aminophenyl) -9, a 9'-G n-hexyl fluorene (M-3), and 3 and 6-G hexyloxy terephthal aldehyde (P-3)

3 and 6-G hexyloxy 0.258g (0.5mmol) 2 and 7-screw (4-aminophenyl) -9, 9'-G n-hexyl fluorene, and 0.167g (0.5mmol) terephthal aldehyde and a 0.0176g calcium chloride are put in, and 1.5ml HMPA and 1.5ml DMSO were added to 50ml flask equipped with the agitator, and it was made to dissolve in it under nitrogen-gas-atmosphere mind. Subsequently, after making said mixed solvent react in ordinary temperature for 24 hours, it was gradually dropped at the 1l. methanol, and the polymer was deposited. Subsequently, after filtering the polymer which

deposited and making it dissolve in chloroform further, the polymer which the methanol was made to reprecipitate and was refined was obtained. Subsequently, after it filtered said obtained polymer and the methanol washed thoroughly, it was made to fully dry in 40-degree C vacuum oven, and the polymer with a yellow of 0.23g (57.5% of yield) was obtained.

¹H-NMR (CDC13), delta 0.74–1.85 (CH₂ and CH₃), 2.01 (br, s, CCH₂), 4.10 (t, –OCH₂), 7.43–7.80 (m, aromatic series), 9.02 (s, ArCH=NAr).

[0111] The polymerization of Example 442, the 7-screw (3-aminophenyl) –9, a 9'-G n-hexyl fluorene (M-5), and a 2, the 7-screw (4-aldehyde phenyl) –9 and a 9'-G n-hexyl fluorene (M-6) (P-4)

In 50ml flask equipped with the agitator under nitrogen-gas-atmosphere mind, 0.516g (1mmol) 2 and the 7-screw (3-aminophenyl) –9, a 9'-G n-hexyl fluorene, 0.542g (1mmol) 2 and the 7-screw (4-aldehyde phenyl) –9, a 9'-G n-hexyl fluorene, p-toluene sulfide and 1 0.003g (0.016mmol) hydrate and a 0.336g calcium chloride are put in, and 3ml HMPA and 3ml DMSO were added, and it was made to dissolve. Subsequently, after making said mixed solvent react in ordinary temperature for 24 hours, it was gradually dropped at the 1l. methanol, and the polymer was deposited. Subsequently, after filtering the polymer which deposited and making it dissolve in chloroform further, the polymer which the methanol was made to reprecipitate and was refined was obtained. Subsequently, after it filtered said obtained polymer and the methanol washed thoroughly, it was made to fully dry in 40-degree C vacuum oven, and the polymer with a yellow of 0.85g (83.3% of yield) was obtained.

¹H-NMR (CDC13), delta 0.74–1.1 (CH₂ and CH₃), 2.11 (br, s, CCH₂), 7.54–8.09 (m, aromatic series), 8.65 (s, ArCH=NAr).

[0112] The polymerization of Example 452, the 7-screw (3-aminophenyl) –9, a 9'-G n-hexyl fluorene (M-5), and an isophthal aldehyde (P-5)

0.516g (1mmol) 2 and the 7-screw (3-aminophenyl) –9, a 9'-G n-hexyl fluorene, a 0.134g (1mmol) isophthal aldehyde, p-toluene sulfide and 1 0.003g (0.016mmol) hydrate, and a 0.224g calcium chloride are put in, and 3ml HMPA and 3ml DMSO were added to 50ml flask equipped with the agitator, and it was made to dissolve in it under nitrogen-gas-atmosphere mind. Subsequently, after making said mixed solvent react in ordinary temperature for 24 hours, it was gradually dropped at the 1l. methanol, and the polymer was deposited. Subsequently, after filtering the polymer which deposited and making it dissolve in chloroform further, the polymer which the methanol was made to reprecipitate and was refined was obtained. Subsequently, after it filtered said obtained polymer and the methanol washed thoroughly, it was made to fully dry in 40-degree C vacuum oven, and the polymer with a white of 0.53g (86.3% of yield) was obtained.

¹H-NMR (CDC13), delta 0.76–1.1 (CH₂ and CH₃), 2.09 (br, s, CCH₂), 7.54–8.52 (m, aromatic series), 8.68 (s, ArCH=NAr).

[0113] The polymerization of Example 461, the 4-screw (3-aminophenyl) –3, 6-G hexyloxy benzene (M-16), and a 2, the 7-screw (4-aldehyde phenyl) –9 and a 9'-G n-hexyl fluorene (M-6) (P-6)

In 50ml flask equipped with the agitator under nitrogen-gas-atmosphere mind, 0.46g (1mmol) 1 and the 4-screw (3-aminophenyl) –3, 6-G hexyloxy benzene, 0.542g (1mmol) 2 and the 7-screw (4-aldehyde phenyl) –9, a 9'-G n-hexyl fluorene, p-toluene sulfide and 1 0.003g (0.016mmol) hydrate and a 0.224g calcium chloride are put in, and 3ml HMPA and 3ml DMSO were added, and it was made to dissolve. Subsequently, after making said mixed solvent react in ordinary temperature for 24 hours, it was gradually dropped at the 1l. methanol, and the polymer was deposited. Subsequently, after filtering the polymer which deposited and making it dissolve in chloroform further, the polymer which the methanol was made to reprecipitate and was refined was obtained. Subsequently, after it filtered said obtained polymer and the methanol washed thoroughly, it was made to fully dry in 40-degree C vacuum oven, and the polymer with a yellow of 0.64g (66.2% of yield) was obtained.

¹H-NMR (CDC13), delta 0.65–1.75 (CH₂ and CH₃), 2.09 (br, s, CCH₂), 4.10 (t, OCH₂), 6.68–8.02 (m, aromatic series), 8.58 (s, ArCH=NAr).

[0114] Under the polymerization (P-7) nitrogen-gas-atmosphere mind of Example 472, the 7-screw (4-carboxyl phenyl) –9, a 9'-G n-hexyl fluorene (M-11), and a 3 and 3'-dihydroxy-benzidine, In 100ml flask equipped with the agitator A 3 and 3'-dihydroxy (1.149g (2mmol) 2 and 7-screw (4-carboxyl phenyl) –9, 9'-G n-hexyl fluorene, and 0.432g (2mmol) benzidine (3 and 3'-dihydroxybenzidine) is put in. 10ml PPMA (a phosphorus pentaoxide/methansulfonic acid) and a 20ml tetramethylen sulfone were added, and it was made to dissolve. Subsequently, the additional reaction was carried out for 3 hours, after making said mixed solution react at 140 degrees C for 1.5 hours and putting in 5ml PPMA further. Subsequently, temperature was reduced in ordinary temperature, the reactant was gradually dropped at 1l. water, and the polymer was deposited. Subsequently, after the thin carbonic acid disodium solution washed the polymer which deposited, it washed it in cold water and the methanol finally washed thoroughly, it was made to fully dry in 40-degree C vacuum oven, and the 1.4g (98% of yield) black polymer was obtained. The obtained polymer was seldom dissolved in the common solvent.

[0115] The polymerization of Example 482, the 7-screw (4-chloro carbonyl phenyl) –9, a 9'-G n-hexyl fluorene (M-12), and terephthalic-acid dihydrazide (P-8 and p-9)

Under nitrogen-gas-atmosphere mind, 0.4g (0.65mmol) 2 and the 7-screw (4-chloro carbonyl phenyl) –9, a 9'-G n-hexyl fluorene, 0.126g (0.65mmol) terephthalic-acid dihydrazide, and a 0.1g lithium chloride (LiCl) were put into 50ml flask equipped with the agitator, and 11ml NMP was dissolved in it. Subsequently, after putting the 0.126g pyridine into said mixture and making it react at 80 degrees C for 4 hours, the temperature of said reactant was reduced in ordinary temperature, it was gradually dropped at the 1l. methanol, and the polymer was deposited. Subsequently, after it filtered the polymer which deposited and water and a methanol washed thoroughly, it was made to fully dry

in 40-degree C vacuum oven, and the polymer (p-8) of 0.475g (99.7% of yield) cream was obtained.

¹H-NMR (DMSO-d₆), delta 0.74-1.05 (CH₂ and CH₃), 2.16 (br, s, CCH₂), 8.0-8.12 (br, aromatic series), 10.82 (s, CONH).

[0116] It was made to flow back, after heated and dissolving 0.2g (p-8) of said obtained polymers in POCl₃, agitating for 4 hours. Subsequently, after it filtered the polymer after dropping said reactant at 1l. water gradually and depositing a polymer, and the methanol washed thoroughly, it was made to fully dry in 40-degree C vacuum oven, and the polymer (p-9) with a yellow of 0.15g was obtained. Solubility fell and the little dissolution of the obtained polymer was carried out at the common organic solvent.

[0117] The polymerization of Example 492, the 7-screw (4-chloro carbonyl phenyl) -9, a 9'-G n-hexyl fluorene (M-12), and isophthalic acid dihydrazide (P-10 and P-11)

Under nitrogen-gas-atmosphere mind, 0.8g (1.3mmol) 2 and the 7-screw (4-chloro carbonyl phenyl) -9, a 9'-G n-hexyl fluorene, 0.253g (1.3mmol) isophthalic acid dihydrazide, and a 0.15g lithium chloride were put into 50ml flask equipped with the agitator, and 18ml NMP was dissolved in it. Subsequently, after putting the 0.252g pyridine into said mixture and making it react at 80 degrees C for 4 hours, the temperature of said reactant was reduced in ordinary temperature, it was gradually dropped at the 1l. methanol, and the polymer was deposited. Subsequently, after it filtered the polymer which deposited and water and a methanol washed thoroughly, it was made to fully dry in 40-degree C vacuum oven, and the polymer (p-10) of 0.9g (94.7% of yield) cream was obtained.

¹H-NMR (DMSO-d₆), delta 0.72-1.04 (CH₂ and CH₃), 2.16 (br, s, CCH₂), 7.80-8.59 (m, aromatic series), 10.82 (s, CONH).

[0118] It was made to flow back, after put in, heated and dissolving POCl₃ in 0.3g (p-10) of said obtained polymers, agitating for 4 hours. Subsequently, after it filtered the polymer after dropping said reactant at 1l. water gradually and depositing a polymer, and the methanol washed thoroughly, it was made to fully dry in 40-degree C vacuum oven, and the polymer (p-11) with a yellow of 0.23g was obtained. Solubility fell and the little dissolution of the obtained polymer was carried out at the common organic solvent.

[0119] The polymerization of Example 502, the 7-screw (3-chloro carbonyl phenyl) -9, a 9'-G n-hexyl fluorene (M-23), and terephthalic-acid dihydrazide (P-12 and P-13)

Under nitrogen-gas-atmosphere mind, 0.5g (0.8mmol) 2 and the 7-screw (4-chloro carbonyl phenyl) -9, a 9'-G n-hexyl fluorene, 0.158g (0.8mmol) terephthalic-acid dihydrazide, and a 0.1g lithium chloride were put into 50ml flask equipped with the agitator, and 11ml NMP was dissolved in it. Subsequently, after putting the 0.126g pyridine into said mixture and making it react at 80 degrees C for 5 hours, the temperature of said reactant was reduced in ordinary temperature, it was gradually dropped at the 1l. methanol, and the polymer was deposited. Subsequently, after it filtered the polymer which deposited and water and a methanol washed thoroughly, it was made to fully dry in 40-degree C vacuum oven, and the polymer (p-12) of 0.54g (92% of yield) cream was obtained.

¹H-NMR (DMSO-d₆), delta 0.62-1.03 (CH₂ and CH₃), 2.16 (br, s, CCH₂), 7.65-8.34 (m, aromatic series), 10.82 (s, CONH).

[0120] It was made to flow back, after heated [they put into them and] and dissolving 0.3g (p-12) of said obtained polymers in 10ml POCl₃, agitating for 4 hours. Subsequently, after it filtered the polymer after dropping said reactant at 1l. water gradually and depositing a polymer, and the methanol washed thoroughly, it was made to fully dry in 40-degree C vacuum oven, and the polymer (p-13) of 0.28g cream was obtained. Solubility fell and the little dissolution of the obtained polymer was carried out at the common organic solvent.

[0121] The polymerization of Example 512, the 7-screw (3-chloro carbonyl phenyl) -9, a 9'-G n-hexyl fluorene (M-23), and isophthalic acid dihydrazide (P-14 and P-15)

Under nitrogen-gas-atmosphere mind, 1g (1.63mmol) 2 and the 7-screw (3-chloro carbonyl phenyl) -9, a 9'-G n-hexyl fluorene, 0.317g (1.63mmol) isophthalic acid dihydrazide, and a 0.1g lithium chloride were put into 50ml flask equipped with the agitator, and 7ml NMP was dissolved in it. Subsequently, after putting the 0.256g pyridine into said mixture and making it react at 80 degrees C for 4 hours, the temperature of said reactant was reduced in ordinary temperature, it was gradually dropped at the 1l. methanol, and the polymer was deposited. Subsequently, after it filtered the polymer which deposited and water and a methanol washed thoroughly, it was made to fully dry in 40-degree C vacuum oven, and the polymer (p-14) of 1.1g (92% of yield) cream was obtained.

¹H-NMR (DMSO-d₆), delta 0.62-1.03 (CH₂ and CH₃), 2.16 (br, s, CCH₂), 7.65-8.59 (m, aromatic series), 10.82 (s, CONH).

[0122] It was made to flow back, after put in, heated and dissolving 20ml POCl₃ in 0.4g (p-14) of said obtained polymers, agitating for 24 hours. Subsequently, after it filtered the polymer after dropping said reactant at 1l. water gradually and depositing a polymer, and the methanol washed thoroughly, it was made to fully dry in 40-degree C vacuum oven, and the polymer (p-15) of 0.38g cream was obtained. Solubility fell and the little dissolution of the obtained polymer was carried out at the common organic solvent.

[0123] The polymerization of Example 522, the 7-screw (4-hydroxyphenyl) -9, a 9'-G n-hexyl fluorene (M-29), and a 2, the 7-screw (4-chloro methylphenyl) -9 and a 9'-G n-hexyl fluorene (M-25) (P-16)

In the three-lot flask of 50ml ** equipped with the agitator and the reflux capacitor under nitrogen-gas-atmosphere mind 0.44g (0.85mmol) 2 and the 7-screw (4-hydroxyphenyl) -9, a 9'-G n-hexyl fluorene, 0.50g (0.85mmol) 2 and the 7-screw (4-chloro methylphenyl) -9, a 9'-G n-hexyl fluorene, and 0.04g (0.17mmol) benzyl triethyl ammoniumchloride are put in. After making it dissolve in 1.7ml DMSO and a 5.2ml toluene mixed solvent, 7ml of 50wt% NaOH water solutions was added. Subsequently, after reducing said reaction temperature in ordinary temperature after making it react at 100 degrees C for 7 hours, agitating said mixed solution strongly, and removing

a water-solution layer, said reactant was gradually dropped at the 1l. methanol containing a small amount of hydrochloric acid, and the white polymer was deposited. Subsequently, after it filtered the polymer which deposited and the methanol washed thoroughly, it was made to dissolve in chloroform further and the polymer which the methanol was made to reprecipitate and was refined was obtained. Subsequently, after it filtered the obtained polymer and the methanol washed thoroughly, it was made to fully dry in 40-degree C vacuum oven, and the polymer with a white of 0.75g (85.2% of yield) was obtained.

¹H-NMR (CDC13), delta0.74-1.1 (CH₂ and CH₃), 2.01 (br, s, CCH₂), 5.09 (s and OCH₂C), 7.08-7.80 (m, aromatic series).

[0124] The polymerization of Example 532, the 7-screw (4-chloro methylphenyl) -9, a 9'-G n-hexyl fluorene (M-25), and 1, the 4-screw (4-hydroxy styryl) -3 and 6-G n-hexyloxy benzene (P-17)

In the three-lot flask of 50ml ** equipped with the agitator and the reflux capacitor under nitrogen-gas-atmosphere mind 0.44g (0.85mmol) 1 and the 4-screw (4-hydroxy styryl) -3, 6-G n-hexyloxy benzene, 0.50g (0.85mmol) 2 and the 7-screw (4-chloro methylphenyl) -9, a 9'-G n-hexyl fluorene, and 0.04g (0.17mmol) benzyl triethyl ammoniumchloride are put in. After making it dissolve in 1.7ml DMSO and a 5.2ml toluene mixed solvent, 7ml of 50wt% NaOH water solutions was added. Subsequently, after making it react at 100 degrees C for 7 hours, agitating said mixed solution strongly, reaction temperature was reduced in ordinary temperature, said reactant was gradually dropped at the 1l. methanol containing a small amount of hydrochloric acid, and the yellow polymer was deposited. Subsequently, after it filtered the polymer which deposited and the methanol washed thoroughly, it was made to dissolve in chloroform further and the polymer which the methanol was made to reprecipitate and was refined was obtained. Subsequently, after it filtered the obtained polymer and the methanol washed thoroughly, it was made to fully dry in 40-degree C vacuum oven, and the polymer with a yellow of 0.7g (79.7% of yield) was obtained.

¹H-NMR (CDC13), delta0.75-1.87 (CH₂ and CH₃), 2.00 (br, s, CCH₂), 4.04 (s, OCH₂), 5.09 (s and OCH₂C), 7.03-7.72 (m, aromatic series).

[0125] The polymerization of Example 542, the 7-screw (4-acetyl phenyl) -9, a 9'-G n-hexyl fluorene (M-34), and the 4 and 4'-diamino -3 and 3'-dibenzoyl diphenyl ether (P-18 and P-18-1)

A 1.49g (14.7mmol) phosphorus pentaoxide and 5ml m-cresol are put into a round bottom flask under an argon ambient atmosphere at the temperature of 0 degree C. After making it react at 110 degrees C for 3 hours and generating a dehydrating agent, temperature is reduced in ordinary temperature. After putting 2, the 7-screw (4-acetyl phenyl) -9, and a 9'-G n-hexyl (4 and 4'-0.5g (12mmol) diamino -3, 3'-dibenzoyl diphenyl ether, and 0.69g (12mmol)) fluorene into a reactor, After having added 10ml m-cresol further, washing the wall surface of a flask and making a solution dilute, temperature was raised quickly and made to react to 110 degrees C for 11 hours. It filtered, after settling the solution after a reaction 3 times in 15% of triethylamine / ethanol solution (15/85), and after ethanol, water, and a methanol washed several times, reduced pressure drying was carried out at 40 degrees C, and the 0.98g (89% of yield) poly quinoline was obtained.

[0126] ¹H-NMR (CDC13), delta0.70-1.38ppm (m, 22H, CH₂, CH₃), 1.85 to 2.38 ppm (m, 4H, CCH₂), 7.10 to 8.60 ppm (m, 32H, aromatic series).

After making 10-5 M concentration dissolve in chloroform P-18 polymer whose maximum PL wavelength was 431nm, 1 or the polymer (P-18-1) with which the acid was added when two drops were made dropped was formed in the concentrated hydrochloric acid of an inorganic acid, maximum PL wavelength changed to 554nm, and this polymer showed photo luminescence.

[0127] The polymerization of Example 552, the 7-screw (4-aminophenyl) -9, a 9'-G n-hexyl fluorene (M-3), and 6-FDA (P-19)

0.50g (0.97mmol) 2 and the 7-screw (4-aminophenyl) -9, and a 9'-G n-hexyl fluorene are put into a round bottom flask under ordinary temperature and nitrogen-gas-atmosphere mind. a 0.43g [after adding 3ml N-methyl pyrrolidone and making it dissolve] (0.97mmol) 4 and 4'-(hexafluoro isopropylidene) JIFUTARU acid anhydride (6-FDA) — putting in — 5ml N-methyl pyrrolidone — adding — 24 hours — the admiration reaction was carried out. Subsequently, having added the 0.47g (5.83mmol) pyridine and the 0.61g (5.83mmol) acetic anhydride, and maintaining the temperature of 40 degrees C, it was made to react for 6 hours and imide-ized. Subsequently, after filtering the precipitate which 1:1 mixed solutions of water and a methanol were made to reprecipitate, and was generated after reducing said solution in ordinary temperature, the methanol washed several times, reduced pressure drying was carried out at 60 degrees C, and polyimide with a thin yellow of 0.81g (90.2% of yield) was obtained.

¹H-NMR (CDC13), delta0.74-1.45ppm (m, 22H, CH₂, CH₃), 1.52 to 2.45 ppm (m, 4H, CCH₂), 7.20 to 8.40 ppm (m, 20H, aromatic series).

[0128] The polymerization of Example 562, the 7-screw (4-hydroxyphenyl) -9, a 9'-G n-hexyl fluorene (M-29), and SEBAKOIRU chloride (P-20)

Put 1g (1.9mmol) 2 and the 7-screw (4-hydroxyphenyl) -9, a 9'-G n-hexyl fluorene, and 0.48g (1.9mmol) SEBAKOIRU chloride (sebacoylchloride) into the round bottom flask equipped with the reflux capacitor under the argon ambient atmosphere, it was made to flow back for five days at 120 degrees C as a solvent using toluene, and solution polymerization was performed. Subsequently, it filtered, after making ordinary temperature cool said reaction solution and settling a methanol 3 times, and after water and a methanol washed several times, reduced pressure drying was carried out at 40 degrees C, and 1.3g (98% of yield) polyester was obtained.

¹H-NMR (CDC13), delta0.58-2.45ppm (m, 34H, CH₂, CH₃, CCH₂), 2.50 to 2.90 ppm (m, 4H, COCH₂), 7.05 to 8.10 ppm (m, 14H, aromatic series).

[0129] The polymerization of Example 572, the 7-screw (4-hydroxy styryl) -9, a 9'-G n-hexyl fluorene (M-36), and a deca fluoro biphenyl (P-21)

Under nitrogen-gas-atmosphere mind, in the two-lot flask of 100ml ** 1.36g (2.38mmol) 2 and the 7-screw (4-hydroxy styryl) -9, a 9'-G n-hexyl fluorene, 0.79g (2.38mmol) deca fluoro BAIFENIRU and 0.87g (6.30mmol) potassium carbonate are put in, after adding 20ml DMAc and making it dissolve, 120 degrees C was raised and the temperature of reaction mixture was made to react for 17 hours. Subsequently, after making ordinary temperature cool said reaction temperature, it was gradually dropped at 1l. water / methanol (1:1) solution, and the yellow polymer was deposited. Subsequently, after filtering the polymer which deposited and making it dissolve in chloroform, the polymer which the 1l. methanol was made to reprecipitate and was refined was obtained. Subsequently, after it filtered said obtained polymer and the methanol washed thoroughly, it was made to fully dry in 40-degree C vacuum oven, and the polymer with a thin yellow of 1.48g (72% of yield) was obtained.

1 H-NMR (CDC13), delta0.72-1.06 (CH2 and CH3), 2.00 (br, s, CCH2), 7.06-7.65 (m, vinyl, and aromatic series).

[0130] The polymerization of Example 582, the 7-screw (4-hydroxy styryl) -9, a 9'-G n-hexyl fluorene (M-36), and 4 and 4'-difluoro diphenylsulfone (P-22)

Under nitrogen-gas-atmosphere mind, in the two-lot flask of 100ml ** 1.36g (2.38mmol) 2 and the 7-screw (4-hydroxy styryl) -9, a 9'-G n-hexyl fluorene, 0.61g (2.38mmol) 4 and 4'-difluoro diphenylsulfone and 0.871g (6.30mmol) potassium carbonate are put in, after adding 20ml DMAc and making it dissolve, 120 degrees C was raised and reaction temperature was made to react for 17 hours. Subsequently, after making ordinary temperature cool said reaction temperature, it was gradually dropped at 1l. water / methanol (1:1) solution, and the cream-colored polymer was deposited. Subsequently, after filtering the polymer which deposited and making it dissolve in chloroform, the polymer which was made to reprecipitate with a 1l. methanol and was refined was obtained. Subsequently, after it filtered said obtained polymer and the methanol washed thoroughly, it was made to fully dry in 40-degree C vacuum oven, and the polymer of 1.3g (70% of yield) cream was obtained.

1 H-NMR (CDC13), delta0.72-1.06 (CH2 and CH3), 2.00 (br, s, CCH2), 7.04-7.92 (m, vinyl, and aromatic series).

[0131] The polymerization of Example 592, the 7-screw (4-hydroxy styryl) -9, and a 9'-G n-hexyl fluorene (M-36) and hexafluoro benzene (P-23)

1.23g (2.1mmol) 2 and the 7-screw (4-hydroxy styryl) -9, a 9'-G n-hexyl fluorene, 0.4g (2.1mmol) hexafluoro benzene, and 0.871g (6.30mmol) potassium carbonate are put in, after adding 20ml DMAc in the two-lot flask of 100ml ** and making it dissolve in it, 120 degrees C was raised in it and the temperature of reaction mixture was made to react to it under nitrogen-gas-atmosphere mind for 4 hours. Subsequently, after making ordinary temperature cool said reaction temperature, it was gradually dropped at 1l. water / methanol (1:1) solution, and the cream-colored polymer was deposited. Subsequently, after filtering the polymer which deposited and making it dissolve in chloroform, the polymer which was made to reprecipitate with a 1l. methanol and was refined was obtained. Subsequently, after it filtered said obtained polymer and the methanol washed thoroughly, it was made to fully dry in 40-degree C vacuum oven, and the polymer of 1.38g (89.6% of yield) cream was obtained.

1 H-NMR (CDC13), delta0.55-1.16 (CH2 and CH3), 2.00 (br, s, CCH2), 7.10-8.60 (m, vinyl, and aromatic series).

[0132] The polymerization of Example 602, the 7-screw (4-hydroxy styryl) -9, a 9'-G n-hexyl fluorene (M-36), and a 4 and 4'-difluoro benzophenone (P-24)

Under nitrogen-gas-atmosphere mind, in the two-lot flask of 100ml ** 1.36g (2.38mmol) 2 and the 7-screw (4-hydroxy styryl) -9, a 9'-G n-hexyl fluorene, A 0.52g (2.38mmol) 4 and 4'-difluoro benzophenone and 0.87g (6.30mmol) potassium carbonate are put in, after adding 20ml DMAc and making it dissolve, 120 degrees C was raised and reaction temperature was made to react for 17 hours. Subsequently, after making ordinary temperature cool said reaction temperature, it was gradually dropped at 1l. water / methanol (1:1) solution, and the yellow polymer was deposited. Subsequently, after filtering the polymer which deposited and making it dissolve in chloroform, the polymer which was made to reprecipitate with a 1l. methanol and was refined was obtained. Subsequently, after it filtered said obtained polymer and the methanol washed thoroughly, it was made to fully dry in 40-degree C vacuum oven, and the polymer with a yellow of 1.47g (82% of yield) was obtained.

1 H-NMR (CDC13), delta0.60-1.12 (CH2 and CH3), 2.00 (br, s, CCH2), 7.04-7.96 (m, vinyl, and aromatic series).

[0133] Example 612, the 7-screw (4-hydroxy styryl) -9, a 9'-G n-hexyl fluorene (M-36), and 2, 5-screw (4-fluoro phenyl) - Polymerization with 1, 3, and 4-OKISA diazole (P-25)

In the two-lot flask of 100ml ** equipped with the Dean Stark trap (Dean-Stark trap) under nitrogen-gas-atmosphere mind 1.36g (2.38mmol) 2 and the 7-screw (4-hydroxy styryl) -9, a 9'-G n-hexyl fluorene, 0.61g (2.38mmol) 2, 5-screw (4-fluoro phenyl) - 1, 3, and 4-OKISA diazole and 0.6g (4.34mmol) potassium carbonate are put in. After adding the mixed solvent of 20ml NMP/CHP (1:1) and making it dissolve, raised reaction temperature at 150 degrees C, it was made to react for 6 hours, and the moisture in a reactor was removed completely. Subsequently, after raising 180 more degrees C and making said reaction temperature react for 20 hours, ordinary temperature was made to cool, said reactant was diluted by NMP, it was gradually dropped at 1l. water / methanol (1:1) solution, and the yellow polymer was deposited. Subsequently, after filtering the polymer which deposited and making it dissolve in chloroform, the polymer which was made to reprecipitate with a 1l. methanol and was refined was obtained. Subsequently, after filtering said obtained polymer and washing thoroughly in order of an acetone, hot water, and a methanol, it was made to fully dry in 40-degree C vacuum oven, and the polymer with a yellow of 1.36g (72.4% of yield) was obtained.

1 H-NMR (CDC13), delta0.58-1.24 (CH2 and CH3), 2.00 (br, s, CCH2), 7.10-8.60 (m, vinyl, and aromatic series).

[0134] The polymerization of Example 622, the 7-screw (4-hydroxy styryl) -9, a 9'-G n-hexyl fluorene (M-36), and a

4 and 4'-difluoro azobenzene (P-26)

In the two-lot flask of 100ml ** equipped with the Dean Stark trap under nitrogen-gas-atmosphere mind 1.36g (2.38mmol) 2 and the 7-screw (4-hydroxy styryl) -9, a 9'-G n-hexyl fluorene, A 0.52g (2.38mmol) 4 and 4'-difluoro azobenzene and 0.6g (4.34mmol) potassium carbonate are put in. After adding the mixed solvent of 20ml NMP/CHP (1:1) and making it dissolve, raised reaction temperature at 150 degrees C, it was made to react for 6 hours, and moisture was removed completely. Subsequently, after raising 180 more degrees C and making said reaction temperature react for 20 hours, ordinary temperature was made to cool, said reactant was diluted by NMP, it was gradually dropped at 1l. water / methanol (1:1) solution, and the yellow polymer was deposited. Subsequently, after filtering the polymer which deposited and making it dissolve in chloroform, the polymer which was made to reprecipitate with a 1l. methanol and was refined was obtained. Subsequently, after filtering said obtained polymer and washing thoroughly in order of water and a methanol, it was made to fully dry in 40-degree C vacuum oven, and the polymer with a yellow of 0.71g (40% of yield) was obtained.

1 H-NMR (CDC13), delta0.58-1.24 (CH2 and CH3), 2.00 (br, s, CCH2), 6.98-8.01 (m, vinyl, and aromatic series).

[0135] Example 632, the 7-screw (4-hydroxyphenyl) -9, a 9'-G n-hexyl fluorene (M-29), and 2, 5-screw (4-fluoro phenyl) - Polymerization with 1, 3, and 4-OKISA diazole (P-27)

In the two-lot flask of 100ml ** equipped with the Dean Stark trap under nitrogen-gas-atmosphere mind 1.0g (1.9mmol) 2 and the 7-screw (4-hydroxyphenyl) -9, a 9'-G n-hexyl fluorene, 0.49g (1.9mmol) 2, 5-screw (4-fluoro phenyl) - 1, 3, and 4-OKISA diazole and 0.66g (4.8mmol) potassium carbonate are put in. After adding the mixed solvent of 20ml NMP/CHP (1:1) and making it dissolve, raised reaction temperature at 150 degrees C, it was made to react for 6 hours, and moisture was removed completely. Subsequently, after raising 180 more degrees C and making said reaction temperature react for 17 hours, ordinary temperature was made to cool, said reactant was diluted by NMP, it was gradually dropped at 1l. water / methanol (1:1) solution, and the yellow polymer was deposited. Subsequently, after filtering the polymer which deposited and making it dissolve in chloroform, the polymer which was made to reprecipitate with a 1l. methanol and was refined was obtained. Subsequently, after filtering said obtained polymer and washing thoroughly in order of an acetone, hot water, and a methanol, it was made to fully dry in 40-degree C vacuum oven, and the polymer with a white of 1.15g (81.8% of yield) was obtained.

1 H-NMR (CDC13), delta0.45-1.42 (m, CH2 and CH3), 1.78-2.38 (m, CCH2), 7.82-8.35 (m, aromatic series).

[0136] The polymerization of Example 642, the 7-screw (4-BUROMO phenyl) -9, a 9'-G n-hexyl fluorene (M-17), and a sodium sulfide (P-28)

5g (7.75mmol) 2 and the 7-screw (4-BUROMO phenyl) -9, the 9'-G n-hexyl fluorene, and the 0.6g (7.75mmol) sodium sulfide were put into the 100ml ampul flask equipped with the agitator, and ampul was sealed, after adding 65ml NMP and making it dissolve. Subsequently, after making said mixture react at 200 degrees C for 48 hours, ordinary temperature was made to cool temperature, ampul was opened wide, the reactant was gradually dropped at the 1l. methanol, and the polymer was deposited. Subsequently, after filtering the polymer which deposited and making it dissolve in chloroform, the polymer which was made to reprecipitate with a methanol and was refined was obtained. Subsequently, after it filtered said obtained polymer and the methanol washed thoroughly, it was made to fully dry in 40-degree C vacuum oven, and the polymer with a white of 3.03g (75% of yield) was obtained.

1 H-NMR (CDC13), delta0.73-1.06 (m, CH2 and CH3), 2.01 (br, s, CCH2), 7.34-7.80 (m, aromatic series).

[0137] The polymerization of Example 652, the 7-screw (4-carboxyl phenyl) -9, a 9'-G n-hexyl fluorene (M-11), and 1, the 4-screw (3-aminophenyl) -3 and 6-G hexyloxy benzene (P-29)

In the 50ml flask equipped with the agitator under nitrogen-gas-atmosphere mind, 0.718g (1.25mmol) 2 and the 7-screw (4-carboxyl phenyl) -9, a 9'-G n-hexyl fluorene, 0.575g (1.25mmol) 1 and the 4-screw (3-aminophenyl) -3, 6-G hexyloxy benzene, and a 0.4g calcium chloride are put in. After adding 3ml NMP, a 1ml pyridine, and 0.9ml triphenyl phosphate, it was made to react at 120 degrees C for 4 hours. Subsequently, after making ordinary temperature cool the temperature of said reaction mixture, it was gradually dropped at the 1l. methanol solution, and the polymer was deposited. Subsequently, after filtering the polymer which deposited and making it dissolve in chloroform, the polymer which was made to reprecipitate with a methanol and was refined was obtained. Subsequently, after it filtered said obtained polymer and the methanol washed thoroughly, it was made to fully dry in 40-degree C vacuum oven, and the polymer with a white of 1.2g (97% of yield) was obtained.

1 H-NMR (CDC13), delta0.75-1.66 (CH2 and CH3), 2.03 (br, s, CCH2), 4.10 (br, -OCH2), 7.03-7.99 (m, aromatic series, and NH).

[0138] The polymerization of an Example 662, 7-screw [4-(3, 4-dicarboxy phenoxy) phenylene vinyl]-9, and 9'-G n-hexyl full orange anhydride (M-37) and 4 and 4'-oxy-dianiline (P-30)

After having put 0.23g (1.15mmol) 4 and 4'-oxy-dianiline (ODA) into the round bottom flask, adding 4ml N-methyl pyrrolidone to it and making it dissolve in it under ordinary temperature and an argon ambient atmosphere, It added and the 0.99g (1.15mmol) 2, 7-screw [4-(3, 4-dicarboxy phenoxy) phenylene vinyl]-9, and 9'-G n-hexyl full orange anhydride and 7ml N-methyl pyrrolidone were made to react for 24 hours. Subsequently, having added the 0.55g (6.95mmol) pyridine and the 0.71g (6.95mmol) acetic anhydride, and maintaining the temperature of 120 degrees C, it was made to react for 6 hours and imide-ized. Subsequently, after it filtered the precipitate generated by water / methanol (1:1) solution by reprecipitating after making ordinary temperature cool the temperature of said reaction mixture and the methanol washed several times, reduced pressure drying was carried out at 40 degrees C, and polyimide with a thin yellow of 1.02g (86.1% of yield) was obtained. 1 H-NMR (CDC13), delta0.72-1.42 (m, CH2 and CH3), 1.62-2.38 (m, CCH2), 6.75-8.10 (m, aromatic series, and vinyl).

[0139] Example 67 structure analysis, ultraviolet rays, photo luminescence, and an electroluminescence property:

Drawing 1 and drawing 3 show the hydrogen nuclear-magnetic-resonance spectrum of the monomer (M-34) of Example 34, and the polymer (P-18) of Example 54, and drawing 2 shows the ultraviolet rays (it abbreviates to UV-Vis Ultraviolet-Visible and the following) and the photo-luminescence spectrum of a monomer (M-34) of Example 34, respectively. Here, when the manufacture approach of a macromolecule thin film was explained, after it dissolved in the 5ml chloroform solution and the 0.2-micron microfilter refined 0.1g (P-18) of polymers first, spin coating was performed, controlling a spin rate so that thin film thickness is set to about 100nm (usually 900 - 1200rpm). Subsequently, after carrying out ordinary temperature desiccation of the sample by which coating was carried out, UV spectrum value was calculated first and it asked for PL spectrum using the wavelength of the maximal value of UV peak searched for. Thus, the obtained result was shown in drawing 4. On the other hand, the configuration of an EL element made the component which has a configuration by ITO / luminous layer / electrode currently most generally used, and investigated EL property. Here, said luminous layer can use what blended the general-purpose giant molecule which mentioned it above, using the copolymer manufactured by said example as it is, for example, a polyvinyl carbazole, the poly methyl (meta) acrylate, polystyrene, an epoxy resin, etc. with the polymer applied to this invention with a chloroform solvent, and chose aluminum as an electrode. The component consisted of carrying out vacuum deposition of the aluminum to the top face of the luminous layer by which spin coating was carried out to the thickness of 100nm on the ITO glass substrate like the manufacture approach of of UV-Vis and PL spectrum test sample which were mentioned above as the production approach. typical — a polymer (P-18) — independent — and the result of EL spectrum of the polymer which blended with the polyvinyl carbazole and was obtained was shown in drawing 5 and drawing 6, respectively.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is drawing having shown 1 H-NMR spectrum of the monomer M-34 of Example 34.

[Drawing 2] It is drawing having shown UV-Vis and PL spectrum of a monomer M-34 of Example 34.

[Drawing 3] It is drawing having shown 1 H-NMR spectrum of the polymer P-18 of Example 54.

[Drawing 4] It is drawing having shown UV-Vis and PL spectrum of a polymer P-18 of Example 54.

[Drawing 5] It is drawing having shown EL spectrum of the polymer P-18 of Example 54.

[Drawing 6] It is drawing having shown EL spectrum (polyvinyl-carbazole--18=8:2) of the polymer P-18 of Example 54 blended with the polyvinyl carbazole.

[Translation done.]

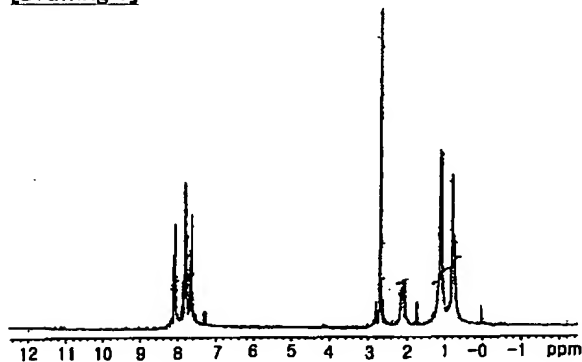
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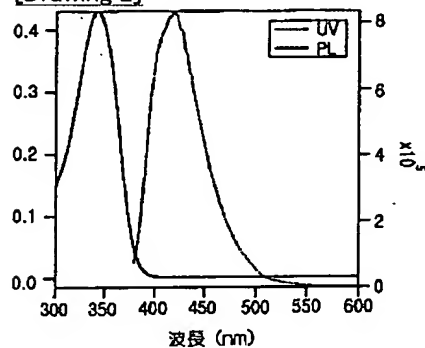
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DRAWINGS

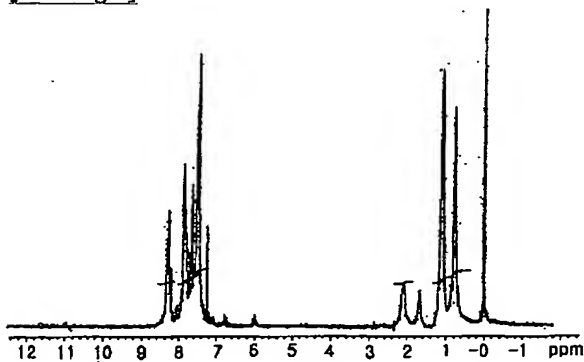
[Drawing 1]



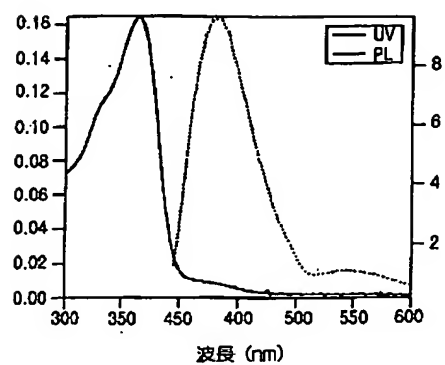
[Drawing 2]



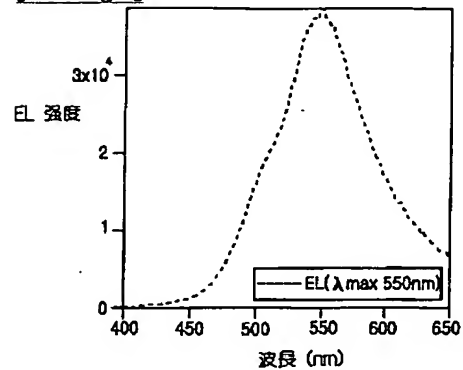
[Drawing 3]



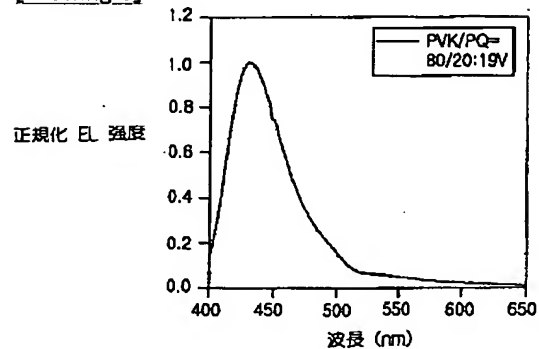
[Drawing 4]



[Drawing 5]



[Drawing 6]



[Translation done.]